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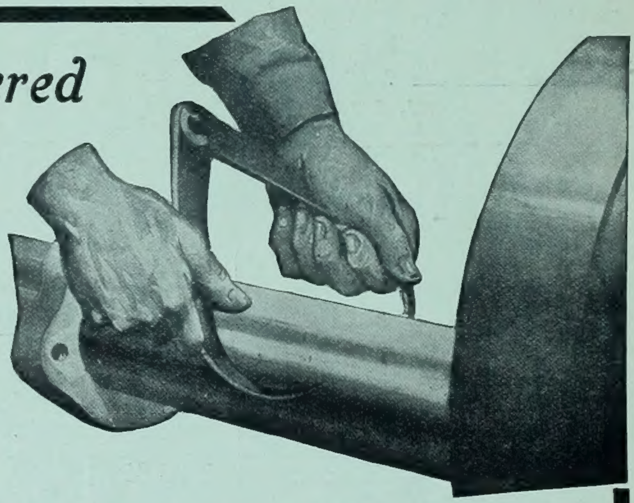

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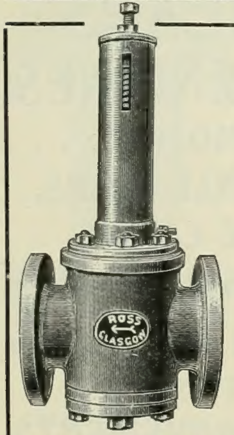

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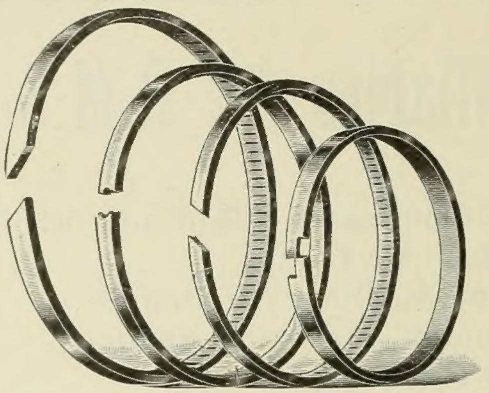

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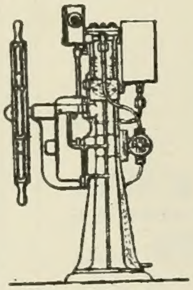

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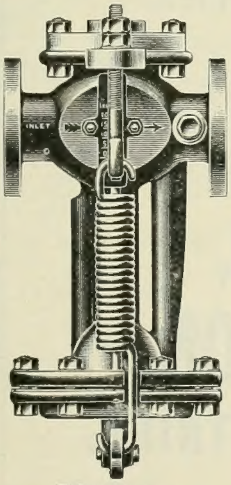

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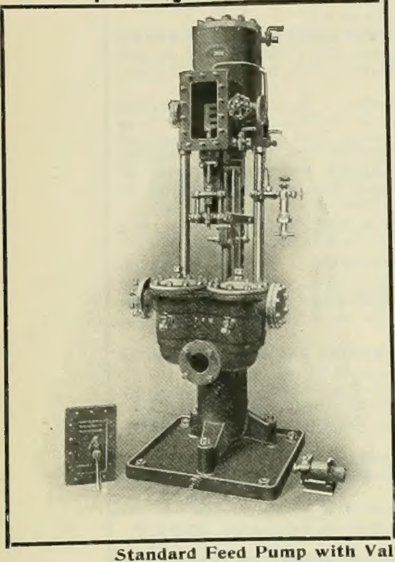

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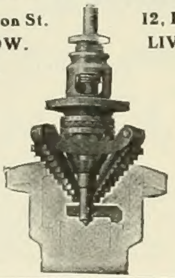

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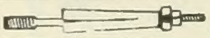

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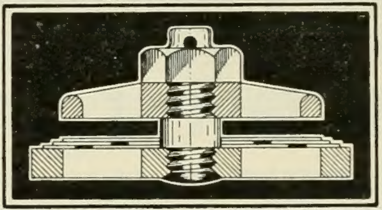

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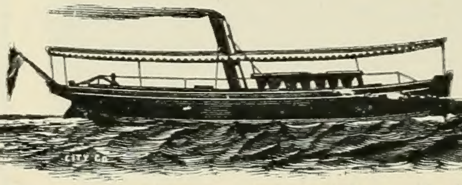

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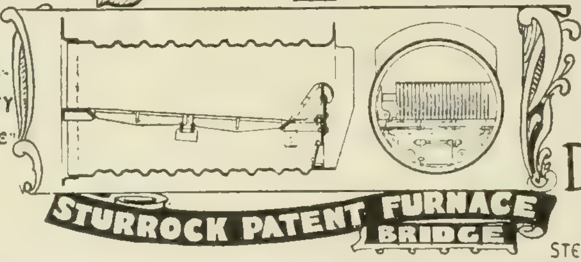

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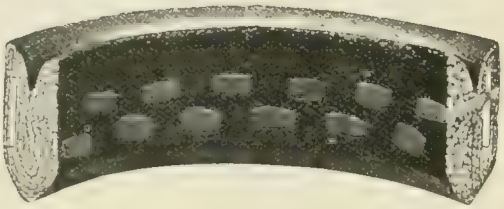

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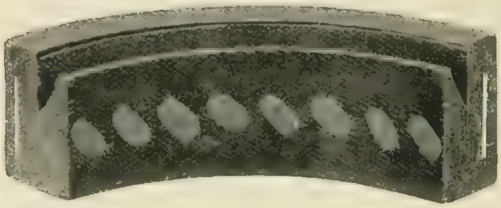

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The Marine Engineer
And Naval Architect.
LONDON, SEPTEMBER, 1914.

THE WAR IN EUROPE.

THE aggressive and arrogant action of Germany has provoked the European conflagration which every thinking person knew would come, sooner or later, and has involved armed conflict between seven continental nations. By the education of its masses, by the work done by its emissaries in foreign lands, by the creation of an immense army and the building of a powerful navy, Germany has done all she could to inspire the world at large that she is destined to be the world-power and to be the dictator of the policy and action of all other nations in the future. This idea has been furthered by the truly remarkable development of German commerce, due to the earnest, self-sacrificing and persevering efforts of the large industrial population. It is pathetic to a degree, that a large proportion of this industrial population, which has been heavily taxed to provide the expenditure involved in the creation of the army and navy, should have to go out to fight, as a part of one or the other, with a full knowledge that whatever the result of the war may be in other directions, their action will undoubtedly cause the destruction of some of their best and most ready markets. The spirit of calm, quiet and deliberate preparation for war by the people of the United Kingdom, and the sympathetic and practical encouragement and assistance extended by the Dominions and Dependencies of the British Crown to the Mother Country in the hour of stress, are in themselves features of good augury, apart from the righteousness of the cause and the maintenance of our honour in fulfilling the engagements we have entered into. The remarkable despatch and efficiency with which the expeditionary force was prepared and transported to the Continent without the public having any evidence of the proceeding, was a triumph of organization and method, particularly in the absence of a single casualty. This, however, could only have been done by the close and never-failing vigilance exercised by the Navy in keeping the Channel clear for the uninterrupted passage of the transports. It is difficult, owing to the rigid censorship and the strict instructions as to secrecy imposed by the Authorities on the Press, to give any special information of the happenings of the past fortnight, but we must all recognise that the intense tension created under the circumstances and the results achieved are deserving of the highest appreciation. One of the points which a short fortnight of war has demonstrated, has been the soundness of the views held by the "Blue water" school of thought. Those who have been railing against naval expenditure for years past must hide their diminished heads, in view of the fact that the existence of our preponderating fleet has enabled us to sweep the oceans and re-open all our trade routes, so that the feeding of the population and the continuance of a large part of our commercial operations, can be carried on, without much more trouble or hindrance than in times of peace. This fact alone makes it quite clear that our annual expenditure on the navy has been in the nature of a premium of insurance against the starvation of the country and the strangulation of our trade, if not the destruction of the Empire. While dealing with this aspect of the question, it may not be inappropriate to refer to the conditions which exist as to the capture of ships and cargoes. Some three years ago, when the Declaration of London was being dealt with, we ventured to express some strong views as to the unfavourable position which this country would be placed in, if the British Government ratified the provisions of the Declaration. It was pointed out at the time that, because the Declaration contained one or two things of great value to this country, it did not follow that to obtain these it would be wise to make important sacrifices on the two great questions of blockade and contraband. This point was put with great emphasis by the ex-Lord Chief Justice of England, Lord Alverstone, who stated that, as to the suggestion of the Convention being modified and controlled by the explanatory report, he would not be justified in advising his country that it would be all right upon some satisfactory explanation in the report being used to construe the Declaration. It will be remembered that in 1911 the Naval Prize Bill, which constituted the ratification act of the Declaration of London, passed through its three stages in the House of Commons with a diminishing majority at each stage and was finally thrown out by the House of Lords on the second reading. The country now has had a fine object lesson and should be deeply grateful for the foresight and judgment displayed by the Upper House. To-day all over the world, German ships are being swept off the sea, and in this way German world trade is being destroyed, so that the resources which helped Germany to start the war are being rapidly dried up. If the Declaration of London had been ratified by the passing of the Naval Prize Bill, we should have bound ourselves not to seize German private property at sea unless it were contraband of war, and have been compelled to permit Germany's mercantile marine to sail the seas and maintain her foreign trade while our soldiers and sailors were fighting and giving their lives to bring her to her knees. The next question is, whether Germany is to be permitted to continue what trade she has left by transporting it in neutral ships. This is a matter which was dealt with by the Declaration of Paris, as long ago as 1856, and is set out in Article four, which prescribes that the neutral flag covers enemy's merchandise with the exception of contraband of war. We believe that this Declaration has never been formally ratified by the British Government, and it seems that unless we openly repudiate that Article we must allow Germany to carry on trade in neutral ships, which she cannot carry on in her own. This important matter must be left to the Powers that be, but we may express an earnest hope that they will take every advantage to cripple as far as possible every effort to sustain trade by Germany, as by so doing the period of war will most certainly be reduced materially. Leaving the war side of the question, may we strongly impress upon our readers that now is Great Britain's great commercial opportunity to increase her prosperity, by cultivating, in every possible way, the enormous markets all over the world which have, in the past, been supplied by

German products. This is no time for sitting down and awaiting the result of the war, which we trust will ensure the peace of Europe for a long period, if not for all time. On the contrary, it is up to every commercial man, now and at once, to find out the new markets for his products, to ascertain what such markets demand, to supply such demand with the fullest appreciation of the details required, and to drop the attitude of "take it or leave it," which has characterised British traders so largely in the past. Let us take to heart the injunction of our present King, when Prince of Wales, "Wake up, England," and our prosperous position as a great nation will be continued for ages to come.

THE NATIONAL RELIEF FUND.

THE fund which the Prince of Wales has started for the relief of distress caused by the war, is being heartily supported, and at the time of going to press the amount subscribed has reached the handsome sum of £1,576,000. It is most desirable that all the energy and administration for such relief should be concentrated in the bodies dealing with the matter, and that the energy of the usual local and independent organizations should be put on one side for a time. Although the sum subscribed already, and which will be subscribed, is large, the demands on it will be enormous, therefore it behoves us all to deny ourselves and give something which we shall really feel, and thus make a sacrifice.

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WHITBY AND WEST HARTLEPOOL.—At Goathland, near Whitby, one of its most respected residents, Mr. Christopher Marwood, J.P., has passed away at the age of 73 years. The deceased gentleman was manager of the Rowland and Marwood Steamship Co., Ltd., and the International Steamship Co., Ltd. West Hartlepool has lost one of its most prominent citizens by the death of Mr. J. F. Wilson, J.P., He was born at Stockton in 1853, and started as a shipowner with Mr. R. Hardy, under the name of Hardy, Wilson & Co., and later as the firm of J. F. Wilson & Co., Ltd.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The War.

AT last the heavy storm cloud which has been threatening the peace of Europe and of the World ever since the passage of the first German Navy Act at the close of the nineteenth century has broken. The end came with sudden and terrific violence. As recently as the 30th July speculative insurances were being done at Lloyd's in the matter of the maintenance of Britain's peace, and as low a premium as twenty guineas was accepted to insure that this country would not be at war within the next six months. When that was the opinion at Lloyd's—and figures sometimes express opinions more eloquently than words—we cannot be surprised if the world's shipping was to a large extent caught napping. None of our British mercantile cruisers were mobilised, though it would appear that Germany had intentions fully a month before the outbreak, for a "Times" telegram from Buenos Aires, dated the 6th August, stated that the liner *Cap Trafalgar*, which had arrived there on the first of the month, had brought a number of extra guns which were being transferred to the other German ships by night. It was intended that this vessel should go across to German South West Africa, but that intention does not seem to have been fulfilled up to the time of writing. How far the arming of German merchantmen may go later on remains to be seen. But the large steamship *Blucher*, which had left the Plate about the 25th July, was recalled by wireless, and eventually came into Pernambuco. So too the Nord Deutscher Lloyd *Kron-Prinzessin Cecilie*—one of the fastest mail steamers in the German Mercantile Marine—having left New York with upwards of two million sterling in specie, did not face the passage along our coasts, and, having masked her appearance as well as she could do with the appliances at her Master's hands, crept back to Bar Haven, Massachussetts, and the protection of the neutral flag. From her refuge her gold was sent to New York and her passengers dispersed to various parts of the United States. She is said to have been actually short of coal when she made the American coast. Curiously enough her namesake, the much smaller vessel of the Hamburg-American fleet, was siezed by the British authorities in Falmouth harbour on the declaration of war. Her tonnage is about 8,000, and with her was taken the 6,000-ton *Prinz Adalbert*. Another vessel of the same line was the *Belgia*, another 8,000-ton twin-screw liner. She was taken off Ilfracombe and is now at Newport, her cargo, principally of food stuffs, being valued at some £200,000. This Company owned the first vessel to fall a physical victim to the war. The *Königin Luise*, built for the North Sea Trade of the Hamburg line, has often been mentioned in these columns. She was an experimental ship, fitted with the new Fottinger Transformers—which seem to have worked very successfully in her case. She had been taken up by the German Government and was fitted as a mine-layer. Pursuing her dangerous work off the mouth of the Thames, she was encountered by a British flotilla of torpedo-boat destroyers, under the convoy of the new protected cruiser *Amphion*, on the morning of the 5th August. Though she promptly took to her heels she was soon overhauled and sunk, the new destroyer *Lance* taking most of the credit for her destruction. The evil that ships do, however, lives after them, and the *Amphion* soon fell a victim to one of the very mines which the *Königin Luise* had laid. It is not for me in this column to dwell on the question of the ethics of mine-laying. But it should be placed on record that assuredly the mine which destroyed the *Amphion* with so many of her own crew and of the survivors of the German vessel, must have been laid prior to the declaration of war.

When the declaration was made a number of important German-Atlantic liners were in the port of New York, amongst them being the *Kronprinz Wilhelm*, the *George Washington*, the *Barbarossa*, *Grosser Kurfurst*, *Pennsylvania*, and *President Grant*. It was said that the *Kronprinz Wilhelm* had been converted into a commerce destroyer, and left New York with some 8,000 tons of coal aboard, and that from this stock she had been sighted filling up the bunkers of two of the German naval cruisers, which were known to be off the coasts of the United States, on the look-out for British vessels.

The other ships were also said to have been loading coal, but nothing more has been heard of them, and evidently they are not at present to venture to sea. The *Imperator* and the *Vaterland*, one at each terminus of their voyage, were stopped from fulfilling their appointed sailings. Reference has been made here only to a couple of the activities of the German mercantile marine, yet it will be seen what a terrible interruption of their business this war has occasioned. For nearly a month the shuttles of the great German instrument of commerce have been idle on the loom. The prospect for Germany and for German industry is serious indeed, whatever be the result of the war. In the Russo-Japanese war, thanks to the pressure of the Wilhelmstrasse in diplomatic circles, Hamburg-American ships were busily engaged as storeships and transports for one of the belligerents, and a very fine thing they made out of that war commercially. But it would not appear that, at the best, there can be much opportunity to them for lucrative Government charters. The compulsory rest of but one of their 50,000-ton ships for a passenger season will make a big hole in the nett earnings of the New York trade. Moreover, it is said that their action in regard to those Americans who had return tickets has been calculated to injure their connection, though it must be remembered that in such matters public memory is short, and people will crowd to the biggest ships of the day. The trouble arose in this way. At the beginning of August, when things got serious, the large number of Americans who were in various parts of Europe all wished to get home at once. Many of them had return tickets of the Hamburg-American Company and naturally wished to avail themselves of them. The steamers of this line having been, at all events temporarily, withdrawn, the holders were at a loss as to what they could do. The White Star people tried to come to the rescue, as they thought that they would be able to come to an arrangement with the Hamburg people, whereby they would be paid for doing the work which the Germans themselves were prevented from undertaking, but they soon found that there was no chance of an arrangement being made. At the same time there was an interruption of the British traffic. The port of Southampton was closed by the authorities for military reasons, and it was thought that many of the more important Atlantic liners such as the *Aquitania*, *Olympic*, *Lusitania*, *Mauretania*, *Oceanic*, *Carmania* and *Caronia* would be called up on their Government engagements. They managed indeed to get through without having to take refuge at New York. A day or two after hostilities commenced the *Carmania* reached Fishguard with specie to the value of some two and a half millions sterling. The *Mauretania* got out all right, though it was said that she was chased for a time by a German naval cruiser. She and the White Star liner *Cedric*, however, made Halifax instead of New York.

The *Lusitania* on her homeward run was also said to have been followed by a German. She got across all right, though, owing to turbine trouble, she was said to have had one of her four sets of engines out of action. It was believed that the Atlantic service of the Cunard Company would have to be maintained single-handed by the *Campania*, and sailings were scheduled in that view, but after a few days the *Lusitania* and *Mauretania* were restored to the list. Similarly the *Olympic* was allowed to resume her work, though her port of departure was changed to Liverpool. The pressure to get back by stranded Americans was very heavy. On Saturday the 15th August three steamers sailed to the westward from the Clyde, taking amongst them, it is said, no fewer than 3,000 passengers, many wealthy people being glad to travel steerage rather than be left behind. Fabulous prices were obtained. From Italy for example an attempt was made to arrange a sailing, but the owners wanted some £40,000 for the risk of the voyage and further a trifle of £1,500 for a cabin for the passage. Better arrangements than this were made in England. The cruising steamer, *The Viking*—formerly the Royal Mail Steam Packet Company's ss. *Atrato* of some 5,500 tons, built at Glasgow by Messrs. R. Napier & Sons—was purchased by a syndicate of American tourists. They proposed to fit her out for the accommodation of 400 passengers for conveyance at fares commencing with a minimum of £100 each. This ship goes on to the United States register for greater safety. Then the Royal Mail Company itself announced that their twin-screw yachting steamer *Arcadian* would sail from Liverpool with passengers for New York at fares similar to those asked for the *Viking*. Then came announcements from the Cunard and White Star managements as to the endeavours they proposed to make to aid in the work of repatriating the stranded Americans. The sufferings and discomfort endured by many tourists who were caught on the Continent and held up by the various army mobilisations—when railway facilities were taken for the troops, when national prejudices were inflamed, and when paper money was valueless—will perhaps never be known. Fortunate were those who managed on crowded steamers to reach the shores of this country. I have heard of one steamship—the last of her line to cross the Channel at the outbreak of war — which, licensed to carry 800 passengers, carried in fact something like four times her complement. Getting to England the sufferings of the tourists, though no longer acute, were by no means ended. Round Cockspur Street and the Haymarket were to be seen sights to be remembered. Long queues of well-behaved and well-dressed people waiting to get into the steamship and express offices in the, for-the-time, unavailing hope of getting money, and to book passages. Great efforts were made to cope with the trouble. Committees were started, with the Savoy Hotel as headquarters, to deal with the distress, and two American battleships, carrying some millions of dollars for the relief of their stranded citizens reached Falmouth on the 16th August.

This story deserves to be set out at length, because it is an instance of the way in which the innocent citizens of a neutral State have been harried and distressed by the indirect results of German aggression. For ourselves the results were naturally much more serious. We were threatened with a money panic and the stoppage of that oversea trade which is the life-blood of our commerce. Things were, however, promptly dealt with. The closing of the Stock Exchange, the introduction of a paper currency of small denomination and the institution of a moratorium met the pressure of the financial crisis within less than a week of the outbreak of the war. The provision of a system of State Insurance of war risks met the difficulties foreseen as possible to our food supplies. Confidence returned to business men, and especially to the shipping community, when it was found that the Fleet of Germany was apparently shut up in the North Sea Harbours. From Norway and Denmark, by the beginning of the second half of August, food supplies began to come again. The cross-channel services were in many cases resumed by our steamships and the ocean sailings were again maintained. Official statements were made as to the safety of the North Sea and also as to that of part of the Atlantic Ocean. Insurance rates, which for a few days had been almost prohibitive, quickly fell and the benefit of sea power to an island and maritime nation were obvious to the business man. Let us hope that, throughout the tremendous and arduous struggle upon which this country is engaged, the weight of our warships will continue to safeguard the fleets of the mail lines and of the food supply ships.

The Panama Canal

Amidst all this excitement in Europe and, indeed, throughout the civilised world, came the crowning event in the history of the gigantic monument to American pertinacity and determination. On the 15th August the United States War Department steamship *Ancona*, dressed with the flags of all nations, passed through the Canal and thus officially opened the great waterway to the peaceful commerce of the world. She carried a large number of important personages, chief amongst them Colonel Goethals, the Governor of the Canal Zone, to whose ability so much is due. Then there were official people of various kinds, including, of course, the Presidents for the time being of the various neighbouring Republics. A number of other vessels followed the *Ancona* which passed through the Gatun Locks in seventy minutes, and the work of so many years was officially completed. The real official opening is fixed for March, 1915. But the simple August ceremony marks the end of the achievement. The draught allowed is, for the time, not to exceed 30 feet. As to speed, in the Culebra Cut, vessels are limited to six knots. When approaching turns steerage way is all that is allowed. But in the Gatun Lake greater speed is allowed according to the width of the Channel. Thus there is a maximum of 15 knots permitted in the 1,000-foot channel.

This speed is reduced to 10 knots where the fairway is only 500 ft. wide. Elsewhere speed may not exceed the 6-knot limit.

A Long Run.

The Liverpool steamship *Architect* has just performed a remarkable feat. Sailing from Seattle in the territory of Washington on the Pacific slope, she steamed right away to Cardiff without once stopping her engines. Her voyage occupied fifty-five days, the distance steamed being 14,338 nautical miles. This gives her an average speed of 10·8 knots, though, on at least one occasion, the vessel exceeded 300 miles in a day's steaming. The *Architect* is one of Messrs. T. & J. Harrison's fleet.

THE P. & O. COMPANY.

The Late Captain Parfitt.

SOME further particulars have been sent to us of the long and honourable career of the late Capt. James Logan Parfitt, whose death on the 5th of July we referred to in our August issue. Captain Parfitt's association with the P. & O. Company extended over a considerable period of years, and he ably carried out the duties of marine superintendent from 1903 until his death. He was born on August 29th, 1849, and entered the P. & O. service as a junior officer at the age of twenty. In January, 1885, sixteen years afterwards, he became commander, and in that capacity was entrusted with many of the mail and passenger steamers of the line, his last vessel being the *Arabian*. His long sea experience in the Company's fleet admirably fitted Captain Parfitt for the shore employment which, some eleven years ago, he embarked upon. Captain Parfitt was the son of a P. & O. commander, and it is worthy of note that several of his sons are serving either ashore or afloat as officers of the line. He was a Younger Brother of Trinity House, and had held active rank in the Royal Naval Reserve, and only a few days prior to his death Captain Parfitt was promoted to the rank of captain (retired).

It is generally understood that Captain F. R. Summers will succeed the late Captain Parfitt as marine superintendent of the P. & O. Company. Captain Summers, who, like his predecessor, has spent many years in the Company's employ, served his apprenticeship in sailing ships engaged in the East Indian trade. Subsequently he was for five years an officer in steamers running to the Mediterranean and the Black Sea. In this service Mr. Summers attained the rank of chief officer. On March 18th, 1885, at the age of twenty-five, Captain Summers joined the P. & O. Company as a junior officer. He became chief officer in August, 1895, and commander in September, 1902. Since then he has had command of the *Ballarat*, *Simla*, *Plassy* and *Egypt*. He resigned command of the last-mentioned vessel a short time ago, and at the present time is carrying out the duties of marine superintendent.

Needless to say, the position is one of great responsibility, and one which necessitates a good deal of attendance on board the Company's ships during the period of their stay in home ports.

The publishers will be pleased if anyone experiencing difficulty in obtaining copies of this magazine will communicate with them at the offices of the journal, 3, Amen Corner, London, E.C.

ENGINEERS' INSURANCE.

THE National Insurance Commissioners have recently given their decision on questions arising as to certain officers employed on the Cunard Company's *Lusitania* and *Carmania*, the Oceanic Steam Navigation Company's *Baltic* and the Leyland boat *Ninian*, the question in the case of each person being whether he is liable to be insured under the National Insurance Acts. The decision reads:—

> That the employment of the senior 2nd engineer, intermediate 2nd, junior 2nd, first senior 3rd engineer, second senior 3rd, third senior 3rd, first intermediate 3rd, second intermediate 3rd, third intermediate 3rd, first junior 3rd, second junior 3rd, third junior 3rd, senior 4th engineer, intermediate 4th, junior 4th, senior 5th engineer, intermediate 5th, junior 5th, senior 6th engineer, intermediate 6th, junior 6th, senior 7th engineer, junior 7th, steering, deck and ventilating engineers, first electrician and extra 3rd officer of s.s. *Lusitania*; senior 2nd engineer, intermediate 2nd, junior 2nd, senior 3rd engineer, intermediate 3rd, junior 3rd, senior 4th engineer, intermediate 4th, junior 4th, senior 5th engineer, senior 6th engineer, senior 7th engineer, and deck engineer of s.s. *Carmania*; 2nd engineer, senior 3rd engineer, intermediate 3rd, junior 3rd, senior 4th engineer, senior 5th engineer, junior 5th, senior 6th engineer, junior 6th, senior 7th engineer, junior 7th, and electrician of s.s. *Baltic*; 2nd engineer and 3rd officer of s.s. *Ninian*, is employment otherwise than by way of manual labour and at a rate of remuneration exceeding in value £160 per year, and is accordingly not employment within the meaning of the National Insurance Acts, 1911-13. That the employment of the 2nd and 3rd electricians, senior and junior boilermakers of s.s. *Lusitania*; boilermaker of s.s. *Carmania*; boilermaker of s.s. *Baltic*; and the 3rd and 4th engineers of s.s. *Ninian*, is employment by way of manual labour, and is accordingly employment within the meaning of the National Insurance Acts, 1911-13, irrespective of the value of the remuneration received.

It is understood that this decision will be accepted as covering the cases of all persons employed under similar conditions in the service of the various companies concerned.

ADMIRALTY AND MERCHANT SHIPPING.

IN reply to Mr. King, member for N. Somerset, who asked for how many merchant vessels there is a right of pre-emption or hire as armed cruisers or transports, Mr. Churchill, in a printed answer has stated that the Admiralty possess the right of hire or pre-emption by virtue of contracts with the following companies:—

Cunard Steamship Company, over all the company's vessels.

International Mercantile Marine Company, over all the British vessels in the association.

In addition to the above, the Admiralty possess rights of hire or pre-emption over the vessels employed under Post Office mail contracts with the following companies:—

Pacific Steam Navigation Company. Service, Liverpool-Callao *via* Magellan; Panama-Valparaiso.

Royal Mail Steam Packet Company. Service, Southampton-West Indies; Southampton-Brazil and River Plate.

Peninsular and Oriental Steam Navigation Company. Service, Brindisi-Bombay; Brindisi-Shanghai; Brindisi-Adelaide.

Union-Castle Mail Steamship Company. Service, Anglo-South Africa.

Alderney Steam Packet. Service, Alderney-Guernsey; Alderney-Cherbourg.

Messrs. MacBrayne, Orkney Steam Navigation Company, North of Scotland and Orkney and Shetland Steam Navigation Company, Glasgow and South-Western Railway Company (purchase only). Service, Scottish Steamer Mail Service.

BALANCING OF INTERNAL-COMBUSTION ENGINES.*

THE problem of balancing internal-combustion engines is in general much more difficult and complex than the corresponding problem with steam engines. The adoption in the former case of the single-acting cylinder and trunk-piston generally necessitates wider crank-angles than with steam. If, on the other hand, a large number of cylinders are employed, vibration arises, owing to the increased length and flexibility of crank-case or framing. A further difficulty in comparison with steam practice arises from the sudden and violent increase of pressure when the charge is fired by a spark, which has nothing comparable in the gradual admission of steam pressure to the piston, whilst, when the charge is fired by high compression, the compression stroke produces a severe reversal of torque in the crank-shaft and reversal of side-thrust between the piston or cross-head and its guide. But while on the one hand the difficulties of balance are greater in the case of the internal-combustion engine, the need of perfection of balance is also greater, owing to the purpose for which the internal-combustion engine is particularly applicable.

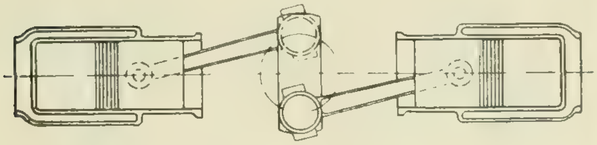

Fig. 1. Engine with perfect balance of mass.

In marine work a very high standard of balance has been set by the steam turbine; for motor-car and aviation purposes an even higher standard is required, for the following reason: When an engine with a very light framing is mounted on a light fusilage, the inertia forces, which are relatively very large, unless well balanced amongst themselves, will communicate vibration to the whole machine. Long-distance flying is at present largely a matter of endurance of the pilot, and vibration, apart from its effect upon the engine and fusilage, induces fatigue and saps the nerves of the pilot and marksman.

Absolute freedom from vibration involves balance of two kinds, balance of mass and balance of impulse.

Balance of Mass.—Dealing first with balance of mass, this requires that if the engine be driven by some external source, the inertia forces due to the acceleration of the rotating and reciprocating parts neutralize each other and have no external resultant. Balance of mass is so well understood by Members of this Institution that it is necessary only to notice very briefly the degree attained with ordinary constructions of internal-combustion engines. Balance of the rotating members, the crank-shaft and cam-shaft, presents, of course, no theoretical difficulty, provided the crank-case is sufficiently rigid to resist the reactions set up.

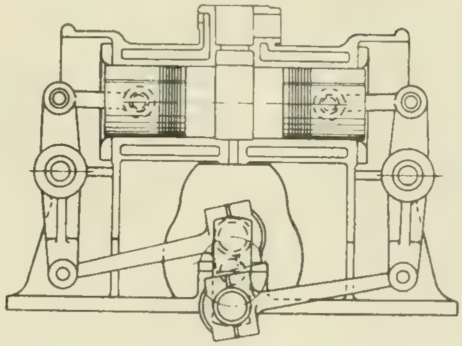

Fig. 2. Arrol-Johnson Engine. Mass and impulse balanced Torque unbalanced.

The inertia forces of the reciprocating parts are of two kinds: Primary forces, such as would result if the piston had simple harmonic motion, that is, if the connecting-rod was of infinite length; and Secondary forces, due to the additional motion resulting from the finite length of the connecting-rod. This secondary motion is almost exactly simple harmonic in character, but has double the frequency. Perfect balance of both primary and secondary forces can together be secured only by placing connecting-rods on opposite sides of the crank-shaft, Figs. 1 and 2. If as usual the crank-shaft revolves, the connecting-rods must be attached to opposite cranks, but, if the cylinders revolve, both connecting-rods can be attached to a single crank, Fig. 3. All three constructions can, however, have but limited application.

The ordinary motor-car engine with four cylinders operating upon the four-stroke cycle necessarily has its crank in one plane, 180° apart in order to give reasonable uniformity of impulse. In this case the secondary forces are wholly unbalanced. When the plane of the cranks is horizontal, the connecting-rod has moved the piston to below midstroke by the amount *a*, Fig. 4, which, if the length of the connecting-rod be four times the crank-radius, amounts to one-sixteenth of the stroke. As this displacement

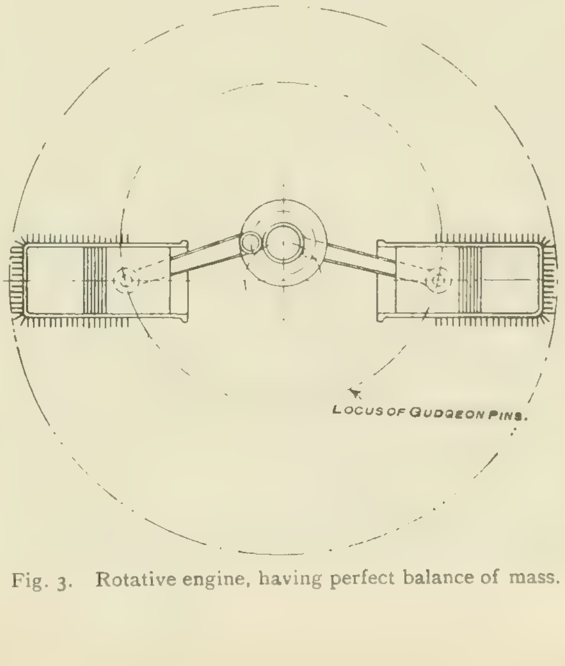

Fig. 3. Rotative engine, having perfect balance of mass.

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*A paper contributed to the Paris Meeting of the Institution of Mechanical Engineers by Mr. H. F. Fullagar, M.A., Newcastle-on-Tyne.

occurs twice per revolution and affects all four pistons, the secondary forces set up are equivalent to the inertia of a single piston moving the whole stroke, but acting with double the frequency. With a connecting-rod of the length of five cranks, the secondary inertia force is four-fifths of this amount. When two such sets of four cylinders are placed together in the "V" type engine, the secondary forces of each set are unbalanced, and their resultant is 40 per cent. greater than either and acts in a horizontal plane, Fig. 5. The secondary forces of the four-cylinder engine, Fig 4, result from the fact that the common centre of gravity of the four pistons, instead of being stationary, as would be the case if the connecting-rods were infinitely long, has a small harmonic motion of double frequency. It can, therefore, be balanced by reciprocating or rotating balance-weights, driven at twice the frequency of the main piston. Mr. Lanchester's ingenious method of doing this is to gear a pair of wheels carrying balance-weights to the main crank-shaft, which drives them at double its speed. As the wheels rotate in opposite directions, the components of the centrifugal forces of the weights always balance themselves in the plane through the axes of the wheels, but have a vertical component which balances the secondary inertia forces. Such a four-cylinder engine, though with its cranks in one plane, will have as a whole complete balance of mass, but the method involves calling into play two otherwise useless forces, with some addition to the weight and number of parts. With four cylinders operating upon the two-stroke cycle, the cranks can, of course, be placed at right angles instead of at 180°, and it is then possible to secure complete balance of both primary and secondary forces, with exception of a couple produced by the secondary forces in the plane of the cylinders and crank-shaft, which tends to rock the engine in a fore-and-aft direction. This couple can usually be neglected in practical application. Engines with five and six cylinders in line, with either cycle, can, of course, be perfectly balanced as to the primary, and almost perfectly as to the secondary inertia forces.

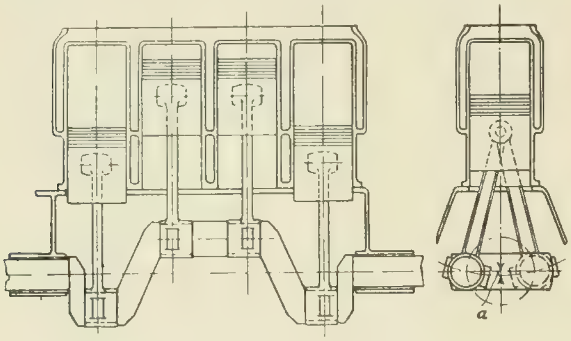


Fig. 4. Ordinary four-cylinder engine.
Secondary forces entirely unbalanced.

To sum up, therefore, the only engine constructions in common use in which balance of mass is completely or almost completely secured by the neutralization amongst themselves of the primary and secondary inertia forces, are the rotating engine, Fig. 3, the engine with five and with six cylinders in line, and the four-cylinder two-stroke engine with cranks at right angles. Of course, also multiplications of these last three of the "V" or radial type engine, in which the parts in each axial plane are balanced, are completely balanced as a whole. All these engines will be vibrationless when driven by an external source, provided the crank-case or framing is itself perfectly rigid. In practice, it is not always possible, if the engine is very long, to obtain sufficient rigidity. With the light motor-car type, even if the crank-case be sufficiently rigid, it is difficult when the crank-shaft is long to make it so stiff that the engine will not tend to vibrate relatively to its fly-wheel, whose mass-centre remains almost stationary.

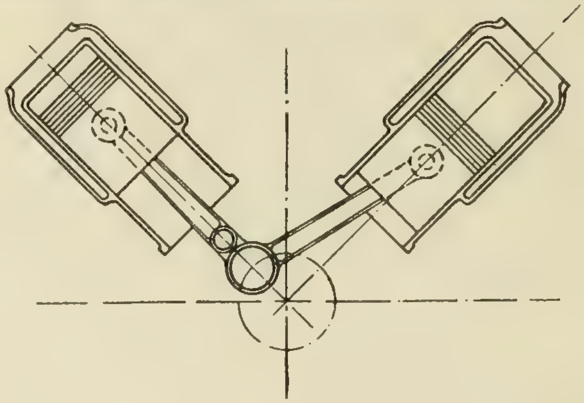


Fig. 5. "V" engine with eight cylinders.
All secondary forces unbalanced.

BALANCE OF IMPULSE.—Balance of mass, is, however, insufficient by itself to produce a vibrationless engine, because it takes no account of the violently fluctuating pressures in the cylinders, and the consequent strains in the crank-shaft and engine framing. To secure freedom from vibration, it is necessary so to arrange the cylinders in relation to the crank-shaft that strains in the framing are either eliminated, or so balance each other as to have no tendency to shift

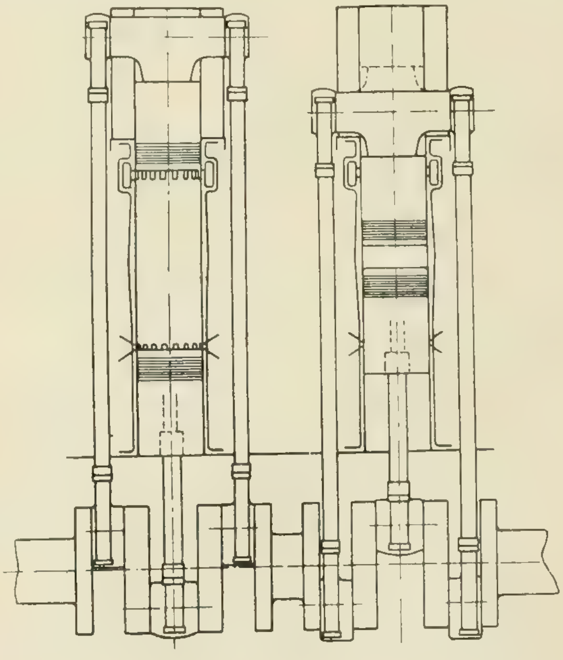


Fig. 6. "Oechelhäuser" engine. Balance of impulse, but without secondary balance.

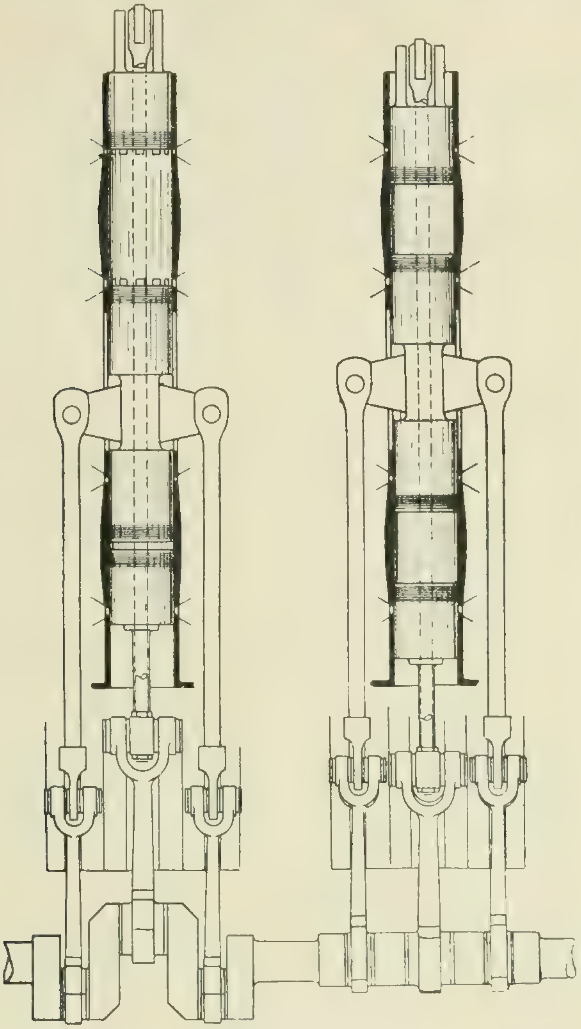


Fig. 7. "Junker" Engine.
Primary and secondary balance of mass and balance of impulse.

the centre of gravity of the engine relatively to its crank-shaft and point of support.

If in Fig. 1 the cylinders are arranged in line and fire simultaneously with exactly equal charges, there will be no tendency for the engine to move, except, of course, to rotate round the crank-shaft. The same result is obtained more simply in Fig. 2, which ensures equal pressures on the two pistons. Junker obtains this equality of impulse, and, at the same time, a valveless two-stroke engine by his well-known arrangement, Fig. 6, but this, unfortunately is unbalanced as to the secondary mass forces. The three cranks of each cylinder receive simultaneous impulses once only per revolution. The crank-shaft of the two-cylinder engine shown, therefore, receives virtually one impulse for every half-revolution. It will be seen, moreover, that in this, as in all single-acting engines, the pressures on the pistons during the compression and explosion strokes twist the crank-shaft first backwards and then forwards, producing a severe condition of stress, whilst the reaction of the crossheads on their guides also alternate in sign with each stroke.

If, however, a second pair of cylinders, each with a pair of pistons, be arranged tandem on the top of the first two, as shown in Fig. 7, each tandem line is then double acting, and the cranks of the two sets can consequently be placed at right angles, when balance of impulse will be obtained with primary and secondary mass balance, except only as regards the rocking secondary couple in the principal plane of the engine. The torque transmitted to the crank-shaft, and the reactions of the crossheads on their guides, will then also be in one direction only. This arrangement, however, involves very great height and large number of parts, together with an expensive form of crank-shaft and the same results are obtained more simply, and without these objections, in the author's arrangement, Fig. 8. In this, two open-ended cylinders, each

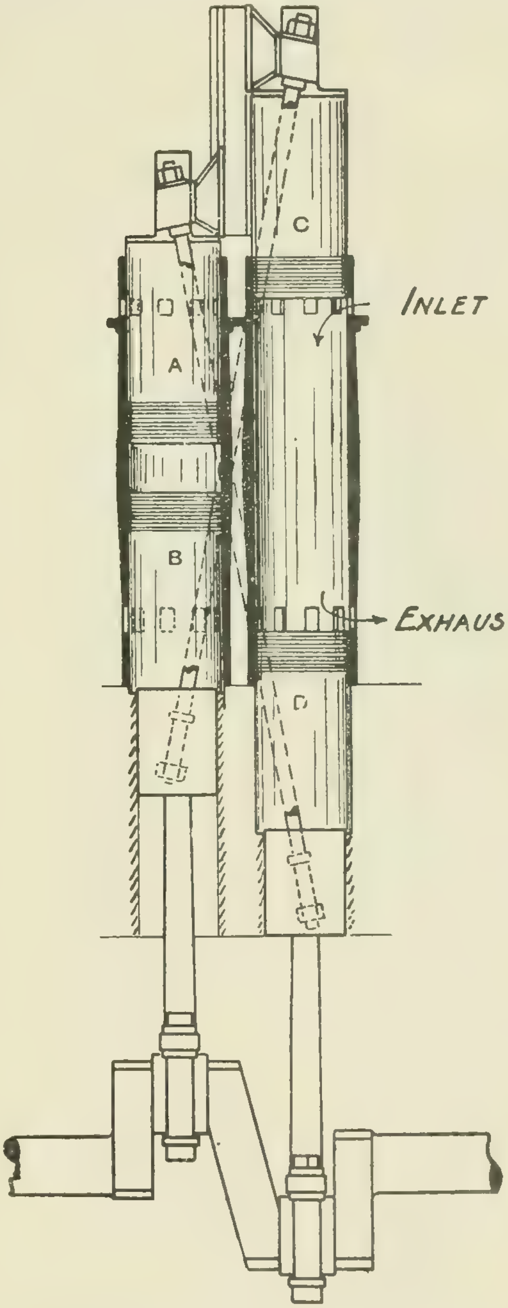


Fig. 8. "Fullagar" Engine.
Primary and secondary balance of mass and balance of impulse, if made with four cranks.

with a pair of opposed pistons, are placed closely together side by side, and the upper piston of one cylinder is connected to the lower piston of the other by a pair of external oblique tie-rods, as shown, the piston A to the piston D, and the piston C to the piston B. An explosion between A and B drives B down and A up, drawing up D by the oblique rods, and giving two equal and opposite impulses to the two cranks. The pistons A and B, in separating, draw together the pistons C and D, compressing the charge between them. The engine operates upon the two-stroke cycle; the pistons at the ends of their stroke uncovering inlet and exhaust ports, as in the original Oechelhäuser arrangement. The complete engine has two such pairs of cylinders, and a second pair of cranks at right angles to the first. The explosions in the four cylinders, acting upon the eight pistons, produce eight impulses per revolution, which are transmitted to the crank-shaft in equal pairs. The vertical forces at all times balance each other, and as in Junker's engine are not transmitted through the engine frame.

On referring to Fig. 9 it will be seen that the pistons of each pair are rigidly joined together and form one moving part. The centre of gravity of the pistons A and D is at the point *q*, and travels up and down on the line *pq*, whilst the centre of gravity of the other pair of connected pistons C and B is at the point *p* and travels up and down on the same line. Thus the primary forces are perfectly balanced, and this is probably the only engine in which the centres of gravity of the balancing masses have exactly the same locus.

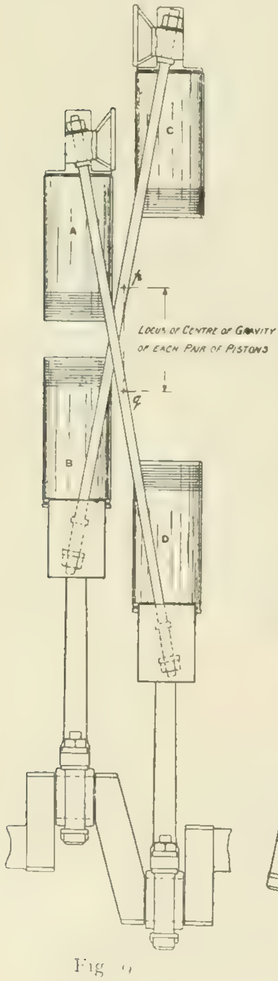


Fig. 9
Complete primary balance.

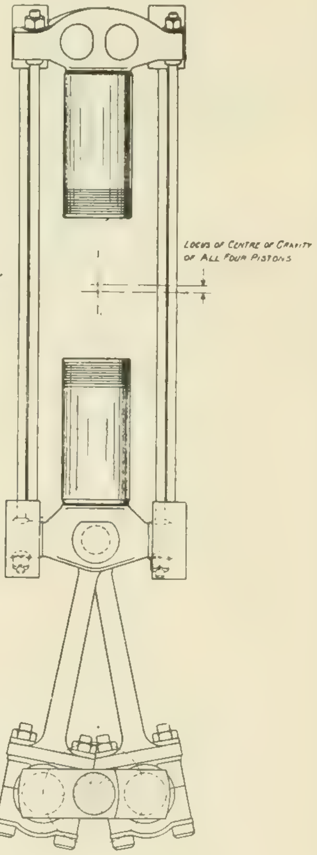


Fig. 10
Want of secondary balance with two cranks only.

Secondary forces result from the fact that the common centre of gravity of all four pistons and their connecting-rods oscillates on the line *pq* with an amplitude which, with a connecting-rod of the length of five cranks, is equal to $\frac{1}{20}$ of the stroke of each piston, Fig. 10. This force is, however, balanced by the corresponding force in the other pair of cylinders which oscillates in the opposite phase, and as the two pairs of cylinders are brought closely together, the secondary couple, which alone remains, is much smaller than in Junker's arrangement. With a six-cylinder engine of this type even this secondary couple is entirely obliterated.

The Fullagar engine, therefore, obtains perfect or nearly perfect balance of mass, with complete balance of impulse. Excepting the small secondary couple above mentioned, no vertical forces are transmitted to the engine frame. The only reactions on the frames are the horizontal thrusts of the crossheads on their guides, which are always in one direction, and are the unavoidable equivalent of the useful torque transmitted to the crank-shaft. In respect, therefore, of the combination of balance of mass, balance of impulse and good turning effort, this engine is probably superior to any other of the reciprocating type hitherto built.

A 500-h.p. engine of this type has been in operation about a year. It has four cylinders of 12 inches (305 mm.) bore, and eight pistons with a common stroke of 18 inches (457 mm.) connected to a four-crank shaft. It develops 550 b.h.p. easily and its weight, including a fly-wheel of 30 cwt. (1,500 kg.), is under 21½ tons (21,000 kg.). The four pairs of connected pistons weigh approximately 2 tons (2,000 kg.), and, at normal speed of 250 r.p.m. when the pistons have a mean speed of 750 feet per minute (3·8 metres per second), there is hardly any perceptible vibration. Even when the speed is increased to 300 r.p.m., giving a piston-speed of 900 feet per minute (4·57 metres per second), vibration is still very slight. At first sight, it might be supposed that the oblique rods would involve considerable friction, but the angle of the rods is less than the maximum angle of the connecting-rods, and this friction is actually less than would be the case if each of the eight pistons had its own crank and connecting-rod. In the 500-h.p. engine above mentioned the mechanical efficiency, excluding the air and gas-pumps, is over 90 per cent.

The condition of balance attained with the cross-connected construction of engine above mentioned is all that could be required for almost every application of internal-combustion engine; but there is still one unbalanced reaction of the engine itself, namely, the effort of each successive impulse to rotate the engine backwards round its crank-shaft, and there is also the gyrostatic effect of the fly-wheel or propeller which, in the peculiar case of aeroplane engines, it may be desirable also to eliminate.

To Mr. Lanchester belongs the credit of having produced the only engine extensively used, in which, in addition to mass balance, torque balance was secured between the working parts of the engine itself.

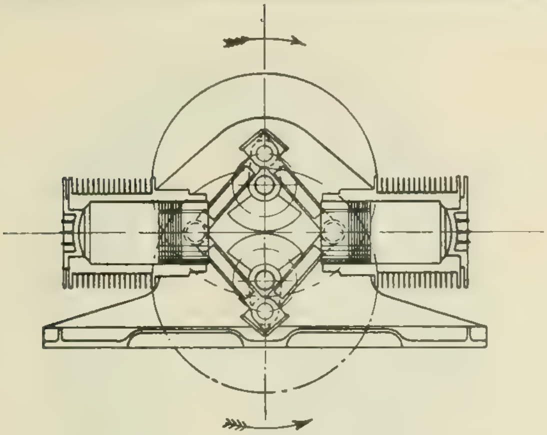


Fig. 11. "Lanchester" Engine.
Mass and torque balanced; impulse unbalanced.

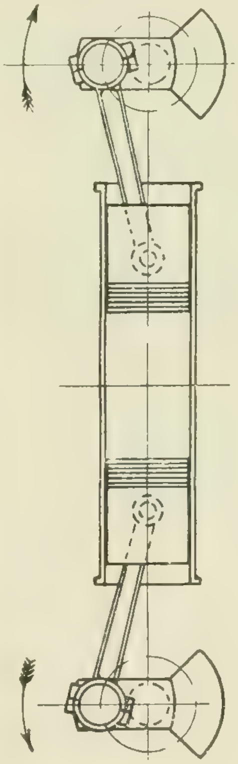
His well-known engine, which is shown in Fig. 11, was fitted to Lanchester cars about 1896. In this, it is sufficient to note, the primary forces were balanced by the balance weights on the crank-shafts; the secondary forces of the pistons balance themselves, whilst balance of torque was secured by the oppositely rotating fly-wheels. Balance of impulse was not obtained.

An engine which secures perfect balance of all forces is shown in Fig. 12. In this, two opposed pistons in a single cylinder are connected to two oppositely moving crank-shafts, at opposite ends of the engine. The shafts need, of course, to be kept in phase by a lay-shaft and screw-gears or by a pitch-chain and spur-gears, though the connection has to perform no appreciable work under normal conditions. This arrangement has the further advantage that for aviation purposes two propellers can be driven directly. If of the same area as a single propeller they will, of course, have a correspondingly less diameter, and for the same revolutions have 41 per cent. greater pitch ratio, a feature which will considerably increase their efficiency. If two such cylinders are placed side by side, and their connecting-rods coupled to opposite cranks, these rods will then balance each other. Such an engine will have absolutely perfect balance of all forces, mass, impulse, torque and gyrostatic effect.

By applying this two-shaft principle to the Fullagar cross-connected cylinder construction shown in Fig. 8 a two-stroke and double-acting engine is produced, in which each crank will receive two impulses per revolution. The engine then consists of two horizontal cylinders with four cross-connected pistons, one piston at either end being connected to separate crank-shafts at either end of the engine. A still better arrangement for the same purpose is shown in Fig. 13, in which a pair of cylinders with cross-connected pistons is arranged in a plane at right angles to that of the shafts. Two such pairs of cylinders can be arranged side by side with the cranks at right angles. Small balance-weights will then be needed to balance the connecting-rods, and four impulses will be transmitted to each crank-shaft per revolution. As the cylinders in either case work on the two-stroke cycle, an air-pump of some kind is required, and in Fig. 13 the two crossheads of each upper cylinder are arranged to act as blowers—a method which has been found satisfactory.

These engines have absolutely perfect balance and consequently exert no force whatever upon the fusilage on which they are mounted, except that due to their weight and to the useful thrust of the propellers when this is taken by the engine framing. All the metal in the stationary part of the engine is, moreover, usefully employed to support the engine and propellers, whilst its disposition renders it readily attached to and supported by the fusilage. Such an engine would appear to meet the requirements of aviation more completely than any arrangement yet devised, and, quite apart from the advantages of being "two-stroke" and double-acting, is, so far as the writer is aware, the only arrangement hitherto proposed which secures at the same time balance of both primary and secondary mass forces, balance of impulse, balance of torque and balance of gyrostatic action.

Fig. 12.
Engine with Mass, Impulse, Torque and Gyrostatic action balanced.



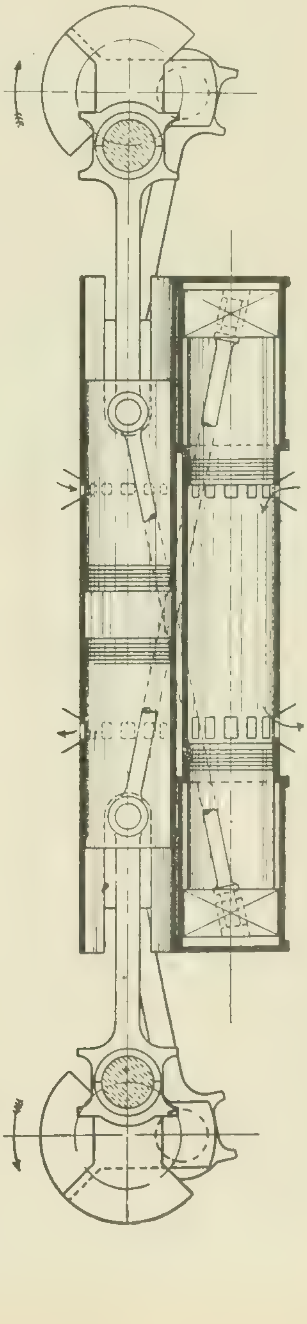


Fig. 13
Double acting valveless engine, with four impulses per shaft per revolution. Perfect balance of all five kinds.

ENGINEERS AND THE ROYAL NAVAL RESERVE.

THE *London Gazette* states that in accordance with the provisions of His Majesty's Order in Council of December 16th, 1912, temporary commissions in the R.N.R. have been issued as follows:—

Chief Engineers—J. G. Crichton, J. G. Fordyce, W. Thompson, J. Young, D. Montgomery, A. MacKie, R. Wilson, F. W. Ruddle, F. Drummond.

Senior Engineers.—T. S. Ferguson, J. L. Smith, A. Corfe, J. Aitken, W. J. Phillip, W. A. F. Wall, J. Jackson, P. H. Pinn, J. Macdonald.

Engineers—J. W. Smith, A. Barrie, J. W. Palmer, J. Brady, J. C. Russel, K. Campbell, D. McDonald, J. Wood, A. C. Lindsay, A. W. Gillespie, J. H. Andrew, J. E. Beale, H. W. Chappell, H. T. Goodwin, J. Stevenson, W. D. Abbott, W. C. O. Taylor, W. J. Hickingbotham, J. Finnecy, G. R. R. Cushing, E. J. Caws, F. P. Voisey, D. R. Jones, G. E. Williams, H. O. Roberts, R. J. Prichard, G. McLean, H. Klitz, J. F. Smith, J. Spence, S. Lash, F. Millward, J. G. Henderson, W. Mackersie, R. Pittendrigh, A. Allen, A. A. I. Kirk, E. A. Rundle, A. V. Monk, J. R. Barclay, L. E. Lawrence, W. J. Bevan, H. J. Warland, J. Beans, R. McIntyre, W. Hall, G. German, J. McDermott, G. Potter, R. McCulloch, C. Ramsey, E. Nicolson, W. Fortay, G. Stephens, R. Oldershaw, A. McGregor, J. Williams, A. Haveling, A. L. Eades, E. A. Davies, W. J. Kinning, E. Lewis, R. E. Gascoyne, H. Breach, E. Ellis, R. Craig, A. Lindsay, C. Shaw, R. Wilson, T. O. Teare, J. Duncan, H. Kendal, C. Rennie, W. Fraser, J. Macpherson, C. Wright, W. J. Blackford, H. W. Punnett, W. Syme, J. Woodend.

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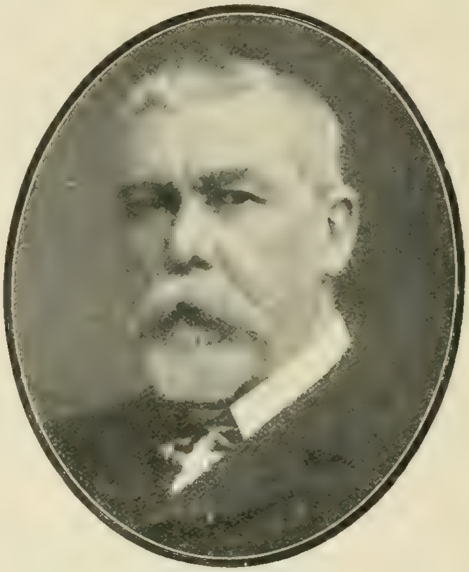
SHIPPING AND MACHINERY EXHIBITION.

OWING to the war, arrangements have been made for the postponement of this Exhibition, which was fixed for September 25th—October 17th this year at Olympia. The Executive Committee have taken the opinion of the exhibitors on the question of postponement, and it has been found that the large majority are in favour of this course. The postponed date will be for a period between 13th July and 14th September next year, but further information will be issued as to the exact date, at the earliest possible moment.

Messrs. Ronald Trist & Co., of 4, Lloyd's Avenue, London, E.C., are introducing a plan for the systematic inspection of their "Thermofeed" regulators throughout Great Britain. Boilers, lifts, steamships and many other factors of modern life are periodically inspected, and it is thought that in the same way, the "Thermofeed" can be made to render still higher efficiency, which means further advantage to buyer and seller alike. The scale of inspection fees has been fixed very low with the object of every machine being willingly put under the Company's supervision and without any idea of monetary profit to them.



The late Mr. John Dempster.

A retired member of the firm of Messrs. Elder, Dempster & Co., Ltd.

The deceased gentleman was 77 years of age at the time of his death.

See Mersey Notes, August issue.

PORT OF LONDON AUTHORITY.

THE fifth annual report of the Port of London Authority, issued recently, states that for the year ended March 31st last the trade of the Port of London, as represented by its shipping, by the value of its imports and exports and by the amounts received in port rates on goods, again exceeded previous records. The total nett tonnage of vessels which arrived and departed with cargoes and in ballast from and to foreign countries and British possessions and coastwise, during the year ended December 31st, was 40,080,282, as compared with 37,676,142 in 1912, an increase of 2,404,140 tons. The nett register and deck cargo tonnage of shipping which entered and left the port and paid river tonnage dues during the year was 30,816,381, of which 21,048,038 was foreign and 9,768,343, coastwise, as against 19,632,865 and 8,875,807 respectively in 1913. As to finance, the capital expenditure of the year amounted to £1,043,180, distributed, among other ways, on schemes for improvements and dock extension (£728,366), new head offices (£44,120), sundry new works, plant, etc. (£93,357), dredging and widening of the Thames (£70,139). The gross revenue of the Authority continued to show expansion and the results were better than in any previous year. The total revenue was £3,434,453, and the total expenditure £2,217,822. The total balance of revenue amounted to £1,216,631, and the balance carried forward is £91,904. It is stated that 38 acres of riverside land at Tilbury have been purchased for the purpose of future extensions of the Tilbury Dock system.

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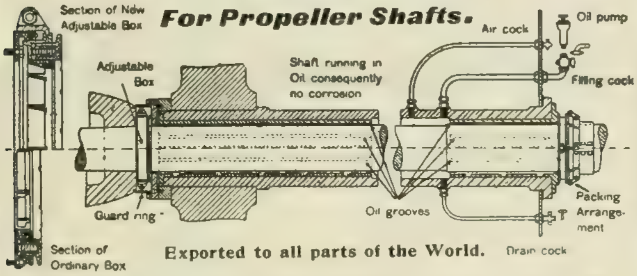

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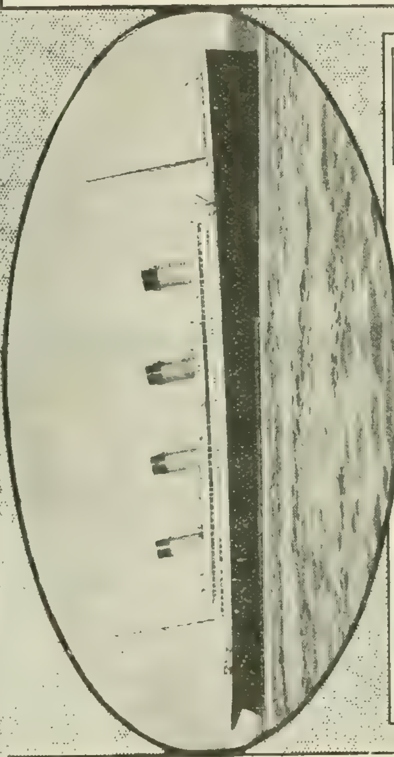

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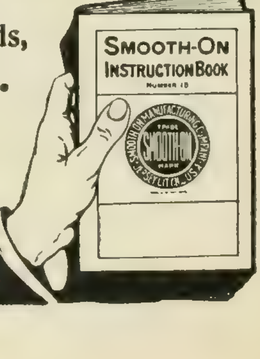

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our Own Correspondent.*)

Portsmouth Dockyard.

THERE must be very little information of a "prospective" character in these notes this month. The great war which has so suddenly come upon us naturally obliges reticence in all that relates to naval and military matters. A month ago, there was hardly anything to indicate to the general public that the calm of peace would be broken. Now what seems likely to be one of the biggest wars in history is being waged between the great nations of Europe. The suddenness of the outbreak did not, however, find the Navy unready, but very much otherwise. In Portsmouth, the change from peace to war was made with wonderful smoothness, so well did the organization work. It was on Sunday, August 2nd, the day following the German declaration of war upon Russia, that the naval reserves were called up. So ready was their response that on the following day the Admiralty was able to announce that "The entire Navy is now on a war footing." As soon as the reserve ships were completed to full crews they left for their war stations. As with the sea-going fleet, so with the local preparations. The harbour defence boom was run out into position, and the harbour closed to all ordinary traffic. Occupants of houses or buildings in the danger zone of the port defences received warning to quit at short notice, and in many other ways measures were taken with the greatest despatch for the adequate protection of the Empire's principal naval arsenal. As readers of these notes may already have learnt, all Germans and Austrians were ordered on August 13th to leave Portsmouth within three days. It was only by some drastic steps such as this that the swarm of spies, many of them provided with carrier pigeons for communication, could be got rid of. At the moment of writing, the town presents a forlorn appearance. Ships come in or go out of harbour at intervals, but silently, and in contrast is the activity in the dockyard. The principal ship undergoing a long refit when war was declared was the *Invincible*, which was paid off on December 31st last, to have her electrically-operated gun-mountings replaced by hydraulic gear. On August 15th, according to the official announcement, she hoisted the flag of Rear-Admiral A. G. H. W. Moore, the late Third Sea Lord, with Captain C. M. De Bartolomé, late Naval Assistant to the First Sea Lord, as her commanding officer. She had been expected before the war to go to the Mediterranean, where her sister ships have been engaged in chasing the *Goeben*, but when and where she is now going it is impossible to say. Everyone agrees that the Admiralty did well to take over promptly the two Túrkish battleships and two Chilian scout-destroyers building in England and publicly to announce the fact. The destroyers have been built over at East Cowes, and are fine vessels of their class. The captain of one of them, the *Faulkner*, is the same officer who commanded the *Amphion*. The *Faulkner* is said to have done over 32 knots on her trials. She is therefore about six knots faster than the *Amphion*. The success of the *Birmingham* in the first submarine attack of the war caused much gratification here, as the cruiser is attached to the Portsmouth command. How she sank the *U* 15 has been told in various ways, some reports representing her success to have been the result of astonishingly accurate firing at the periscope and conning tower, and others ascribing it to her ramming the submarine's hull. The best thing is to wait until the crew themselves are able to describe the exploit.

Devonport Dockyard.

The war has thrown a veil over the greater part of the happenings of the past month, and therefore only a general idea may be given of the busy time which the authorities have had in preparing reinforcements for the First or fully-manned Fleet. The latter, of course, needed no dockyard assistance when it was ordered to put to sea on July 29th. It is always "instantly ready." On this occasion, the Second Fleet was a close rival in point of readiness, for the balance crews of its ships, which after the test mobilization from July 15th to 25th, should have gone back to the barracks and training schools, were ordered to be re-embarked, the shore establishments remaining closed. Having just been carried out as a peace test, the completion of the crews to full strength when the real thing threatened could be carried out much more quickly. So it was with the Third or Reserve Fleet. Practically all of its ships had been to sea during the test mobilization, and the reservists in their crews had only been at their homes about a week when they were called up again. In the dockyard, preparations went forward at full speed, but the Press maintaining a patriotic silence and officers and men exercising caution in giving away information, the public at large could not have realized the significance of the operation of placing the entire Navy on a war footing. All grades of workmen responded well to the call for additional work. There was a larger proportion of Third Fleet ships to be sent to sea from Devonport than from any other port, but they were all got away without undue delay. Within a few days, some of the prizes captured on the trade routes began to come in. One of the first was that of the German steamer *Schlesien*, of Bremen, a Norddeutscher Lloyd vessel of 5,536 tons, which it is officially announced was captured by the light cruiser *Vindictive*. This liner furnished the first case in the Prize Court, which has been set up for the first time in sixty years, and it was announced on August 14th that an action had been instituted in the Court by the Procurator-General against the owners and for the vessel's "condemnation." In addition to the ships already in commission, work has been pushed on with those under construction, especially those completing afloat. It may be taken for granted that every effort will be made to get these to sea in time to take part in the war. The taking over of the Turkish battleship *Osman I.* created great interest here. Few of those who saw this fine vessel come into Devonport for docking in July thought that within a month she would be flying the British flag. If rumours are to be believed, however, the Admiralty acted none too soon in acquiring this vessel and the *Reshadieh*, for the Germans might have got them had they been allowed to go out of England. With her 27,000 tons, the *Osman I.* is among the heaviest battleships in the world, and she should do some good work as the *Agincourt*, with which name she has been re-christened. The sinking of the *Amphion* by a mine caused a widespread feeling of gloom in Devonport, where the vessel's crew belonged. There is some satisfaction, however, in learning that those who were killed died instantaneously as a result of the explosion which shattered the fore part of the vessel. No one seems to have been drowned. The circumstance, too, that a frail light cruiser of this class could keep afloat for nearly half an hour after being struck has shown that the mine is less deadly than was formerly supposed. A battleship, with armoured sides and armoured bulkheads, would probably be much less damaged.

Chatham Dockyard.

In common with the other naval ports, we have been passing through a most strenuous time. Nothing quite like it has ever happened before within the memory of the present generation. When the King went down to Spithead on July 18th and led the squadrons to sea two days later, few that witnessed the spectacle, if anyone at all, thought that within three weeks the country would be at war. Fortunately, the call for action came at a moment when the Fleet was fully prepared to answer it. We were expecting the Chatham ships back from the mobilization and combined exercises on July 27th, but orders came that they were being kept at Portland as a precautionary measure. Two days later, they slipped away into the North Sea, and we have not seen them since. Possibly by the time we do they may have been called upon to defend the honour of Britain in a fleet engagement, of the ultimate result of which there can be no doubt. As to the dockyard preparations, the public and national interests demand that no information shall be given which might be of use to the enemy, and more particularly to the spies who are known to flourish in or near our great naval ports. It may safely be said, however, that not only has everything possible been done for the local defence, and not only is every new ship in the yard being hurried forward to completion, but arrangements have been made for meeting the needs of the Fleets at sea in every way that forethought and provision can suggest. The announcement that the Government were buying the two Turkish battleships *Osman I.* and *Reshadieh* inspired a belief that we should see the last-named here as soon as she was ready to leave the Vickers yard. This seems most unlikely, however, as the later "Dreadnoughts" have been attached to the Portsmouth and Devonport commands, which are better situated and more convenient for docking such huge vessels. On the other hand, Chatham for administrative purposes may be the manning port of the two scout-destroyers taken over from Chile and renamed *Faulknor* and *Broke*. Most of the destroyers in the First Fleet used to be manned from the Chatham Barracks. This is the case with those in the Third Flotilla, which so smartly discovered the Hamburg-Amerika liner *Königen Luise* off the Suffolk coast and put a stop to her mine-laying enterprise. This first action of the war showed that the destroyer gunners know how to shoot. The *Lance*, which was only delivered from Thornycroft's on the previous Saturday, and the *Lark* and *Linnet* came in for special mention in the newspaper accounts, but the Flotilla as a whole must have credit for the manner in which they reconnoitred the mine-layer. It is said that she was chased for thirty miles before they opened fire upon her.

Sheerness Dockyard.

As the principal port for ships of the Second Fleet, and the base of a large number of torpedo craft, it may readily be imagined that the past month has been one of great activity for Sheerness. When it became known that leave was stopped in all ships of the First Fleet on July 27th, there were only two vessels of that force in the Medway, the *Shannon* and *Natal*, the former having come in to receive the flag of Rear-Admiral the Hon. S. A. Gough Calthorpe in exchange for that of Rear-Admiral C. E. Madden as commander of the Second Cruiser Squadron. Rear-Admiral Madden was to have gone to the Admiralty as Third Sea Lord. He never took up this post, however, as on the outbreak of war he accompanied his brother-in-law, Admiral Sir John Jellicoe, to the Home Fleets as Chief of the Staff. As soon as the *Shannon* and *Natal* had put to sea to rejoin the First Fleet, attention was directed to the Second Fleet ships, which had been ordered to remain at their home ports in proximity to their balance crews. Any small defects needing attention were quickly adjusted in preparation for all eventualities. It must be admitted, however, that the calls on the dockyard were small, for such is the high state of efficiency of the Second Fleet, which is manned by nucleus crews, that its ships always have on board their full war requirements and are kept in a state of readiness for sea. On August 3rd, the Admiralty announced that the whole Navy was on a war footing, and by the end of that week the harbour was practically cleared right out of ships. This did not mean any lessening of activity in the yard, however, as preparations had to be made for executing prompt repairs to any damaged vessel which might come in. The marvel is that nothing of the kind is reported to have occurred. When vessels are manœuvred at high speed without lights on dark evenings in all parts of the North Sea, perhaps among all kinds of other vessels—trawlers, steamers, transports, and the like—the fact that none of them come to grief is a tribute to the skill and judgment of the young officers in command and their well-trained crews. One of the destroyers undergoing refit when war broke out was the *Doon*. This boat was boarded by Dr. Macnamara, the Parliamentary Secretary, during his visit to the yard for the hearing of workmen's petitions in July. The doctor stripped himself of his hat and coat and descended into the *Doon's* stokehold to get an idea of the conditions under which the stokers work there.

Pembroke Dockyard.

One of the first results of the strained situation which existed at the end of July was the speeding up of work on the hospital ship *Maine* at this yard. It was the one unfortunate item in the naval outlook at that date that not more than a week or two previously the old hospital ship *Maine*, the only vessel of the kind in the Fleet, went aground in the Firth of Lorne and became a total wreck. Her name, in order to preserve the memories associated with her presentation to the British Navy at the time of the Boer War by a group of American ladies, was ordered to be given to the vessel fitting out here, which was to be called the *Mediator*. This will not be the only hospital ship serving in the war, of course, for many private people and organizations have patriotically come forward to place their yachts or vessels of a similar character at the disposal of the Admiralty as hospital ships. Lord Tredegar has given his steam yacht *Liberty*, Lady Beatty her yacht *Sheelah*, the women of Canada are giving a vessel, and others have also come forward to assist in this direction. There was some feeling of apprehension in Pembroke and its neighbourhood during the first days of hostilities, a feeling which may probably have been experienced in other parts. Various alarmists have been fond of asserting that the important trade route through St. George's Channel to Liverpool would attract perhaps the first attention of an enemy's commerce raiders, and some people professed to be anxious about the safety of the Bristol Channel and its ports adjoining the great Welsh coalfields. The majority were, of course, reassured by the official statement that the German Navy was only represented by some five small cruisers and a few armed merchantmen in the Atlantic, and that these were being hunted down by about four times as many British cruisers. Of the two destroyers under refit last month, the *Garry* had been finished and had run her trials before war was declared. Her basin trial of the propelling machinery took place on July 24th and the full-power trial immediately afterwards. The *Garry* was refitted most expeditiously, in a few days under four months, as compared with the five months occupied by the refit of previous destroyers.

MERCHANT TONNAGE OF THE WORLD.

A REPORT showing the progress of merchant shipping throughout the world was issued as a Parliamentary Blue Book on 1st August. From this we find that at the end of 1912 the United Kingdom possessed sailing vessels with a total of 902,718 nett tons and steam vessels of 11,894,791 nett tons. Canada, sail and steam, 836,084 nett tons. Australia 439,253. New Zealand 156,080. Newfoundland 149,230. British India, including Ceylon, 115,186. Other British Possessions 255,741. The total for the British Empire, sailing and steam vessels, is 13,846,365 tons excluding Shanghai, which has 55,451 tons. The total nett tonnage, sail and steam, for other countries is as follows:— United States of America, 7,714,183. Germany 3,153,724. Japan 1,937,888. Greece 484,905. Belgium 181,637. In the following countries the figures given are those for 1911, the tonnage for 1912 not being available. Norway 1,646,030. France 1,462,639. Italy 1,107,187. Spain 794,406. Sweden 765,068. Russia 742,802. Netherlands 565,613. Denmark 538,863. Finland 399,638. Austria 361,831. Hungary 134,010. Portugal 114,037. China 105,818. The total nett tonnage for the world in 1911 was 34,885,083. In 1912 vessels to the number of 5,373 and of 20,275,120 nett tons, passed through the Suez Canal. 3,335 vessels of 12,847,621 tons were British.

NAVAL PRIZE COURT AND CAPTURES.

BY the Judicature Act, 1891, the Prize Court for Great Britain and Ireland is the Admiralty Court of the Probate, Divorce and Admiralty Division of the High Court, of which Sir Samuel Evans is President. The Admiralty Registry, with the Registrar, the Marshal and staff, forms the Prize Court and the Prize Registry and is situated in the Royal Courts of Justice. Every ship taken into port as a prize or seized in port by a Collector of Customs has to be delivered over to the Marshal as Officer of the Prize Court, for safe custody. It is interesting to note that the last Prize Court was held in 1854 during the time of the Crimean War.

In connection with Prize Money, it will be remembered that the First Lord of the Admiralty in his speech on the Navy Estimates stated "that the Board of the Admiralty had decided to recommend to the

Government the abolition of prize money," and it was stated by the Attorney-General last month in introducing a "Bill to amend the law relating to the procedure in Prize Courts" that the Government had accepted the recommendation, but the question of the issue of some grant or bounty to sailors during the course of the war is under consideration. A number of the enemy's captured vessels have been already advertised by the Admiralty Marshal's office for "condemnation," and are as follows:—

Albert Clement (Rostock), steamer, 1,165 tons. O. Zelck. Seized at South Shields.

Altze (Westrhauderfehn), sailer, 68 tons. Seized at Hull.

Belgia (Hamburg), steamer, 8,132 tons. Hamburg-America Co. Large amount of specie and £200,000 worth of food stuffs. Seized at Newport (Mon.).

Blonde (Danzig), steamer, 613 tons. Seized at London.

Carl (Hamburg), sailing vessel, 1,993 tons. Seized at Cardiff.

Chile (Bremen), sailing vessel, 2,182 tons. Messrs. J. Tideman and Co. Seized at Cardiff.

Else (Leer), sailer, 223 tons. Captured by H.M.S. *Diana*.

Emma Minlos (Lubeck), steamer, 1,272 tons. Alfred Minlos. Seized at Middlesbrough.

Erna Boldt (Rostock), steamer, 1,731 tons. Seized at London.

Frido (Brake), sailer, 99 tons. Captured by H.M.S. *Ringdove*.

Greenbank (West Hartlepool), steamer, 3,881 tons, cargo only Seized at Cardiff.

Horst Martini (Rostock), steamer, 946 tons. Seized at Newport (Mon.).

Hans Leonhardt (Hamburg), steamer, 1,273 tons. Messrs. Leonhardt & Blumberg. Seized at London.

Heinrich (Geestemunde), sailer, 125 tons. Seized at London.

Johanna (Leer), sailer, 223 tons. Captured by H.M.S. *Eclipse*.

Katharina (Rhandermoor), sailer, 133 tons. Seized at London.

Kronzprinzessin Cecilie (Hamburg), steamer, 8,689 tons. Hamburg-American Line. Seized at Falmouth.

Llanberis (London), steamer, 4,064 tons, cargo only. Seized at Cardiff.

Llanishen (London), steamer, 3,[illegible]3, tons, cargo only. Seized at Cardiff.

Möwe (Rhandermoor), sailer, 88 tons. Captured by H.M.S. *Ringdove*.

Marie Glaeser (Rostock), steamer, 1,317 tons. O. Zelck. Captured by H.M.S. *Gibraltar*.

Marie Leonhardt (Hamburg), steamer, 1,047 tons. Messrs. Leonhardt & Blumberg. Seized at London.

Nauta (Flensburg), steamer, 1,137 tons. J. H. Jensen. Captured by H.M.S. *Ringdove*.

Occident (Flensburg), steamer, 813 tons. Seized at London.

Ottokar (Königsberg), steamer, 957 tons. Seized at Plymouth.

Perkeo (Hamburg), late *Brilliant*, four-masted barque, 3,765 tons. Captured by H.M.S. *Zulu*.

Prosper (Danzig), steamer, 759 tons. Seized at London.

Prinz Adalbert (Hamburg), steamer, 6,030 tons. Hamburg-American Line. Seized at Falmouth.

Rhenania (Flensburg), steamer, 874 tons. Seized at Port Amble.

R. C. Rickmers (Bremerhaven), auxiliary sailing vessel, five masts, 5,548 tons. R. Rickmers. Seized at Cardiff. This is the largest sailing ship in the world.

Schlesien (Bremen), steamer, 5,536 tons. Nord D. Lloyd. Captured by H.M.S. *Vindictive*.

Schwarzenbek (Hamburg), sailing vessel, 1,970 tons. Messrs. Knöhr & Burchard. Seized at Cardiff.

Southfield (Cardiff), steamer, 3,506 tons, cargo only. Seized at Cardiff.

Tredegar Hall (London), cargo only. Seized at Weymouth.

Theodor (Barssel), sailer, 207 tons. Captured by H.M.S. *Panther*.

Tommi (Hamburg), sailer, 138 tons. Seized at London.

Ulla Boog (Rostock), steamer, 1,698 tons. Otto Zelck. Captured by H.M.S. *Challenger*.

Wilhelm Behrens (Rostock), steamer, 1,259 tons. T. W. Fischer. Captured by H.M.S. *Grafton*.

The capture of German and Austrian vessels is taking place in all parts of the world, the ships gathered in by England, France and Russia being reckoned at about 200 at the middle of August and representing a tonnage of one million and a large monetary value. The Belgians, according to a telegram from Antwerp have taken possession of twenty-two German vessels at that port, and another report says that a large number of German vessels and some Austrian have been seized in Russian ports. There are still a number of German vessels remaining at sea and consequently liable to capture, and these vessels represent a very considerable tonnage.

It is officially intimated that all persons having any interest in cargoes, other than enemy cargoes, laden on enemy ships captured as prizes, and requiring a release of such cargoes or portion of cargoes should make enquiries in London at the offices of the Procurator General, Treasury Chambers, Whitehall, and at the outports of the United Kingdom at the offices of the agents for the Procurator General, whose addresses can be obtained from the Collectors of Customs at the outports.

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.

THE above Institution has been registered as a Company and the following announcement states the objects of the Company—

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS (Incorporated). (Word Limited omitted from title by licence of the Board of Trade.)

Registered Aug. 7th, by Dyson & Co., Caxton House, Westminster, as a company limited by guarantee with an unlimited number of members, each liable for £1 in the event of winding up. Objects: To take over the assets and liabilities and continue the work of the unincorporated institution established in 1884 and known as the North-East Coast Institution of Engineers and Shipbuilders; to carry into effect an agreement with Wm. Boyd, Sir W. Theodore Doxford, Hy. Withy, James Marr, and Wm. G. Spence; to advance the sciences of engineering and shipbuilding, etc. The subscribers are: W. Boyd, Benton House, The Park, Cheltenham, engineer. Hon. Sir Chas. A. Parsons, Ray House, Kirkwelpington, Newcastle-on-Tyne, engineer. Col. R. Saxton White, Shirley, Jesmond, Newcastle-on-Tyne, shipbuilder. S. Hunter, 1, Manor Terrace, Tynemouth, engineer. Sir W. Theodore Doxford, Sunderland, shipbuilder. W. H. Dugdale, Wearcourt, Roker, Sunderland, shipbuilder. W. G. Spence, 4, Woodside, Sunderland, engineer. The Solicitors are Messrs. Cooper and Goodyer, of Newcastle-on-Tyne.

THE "ANTHONY" PUMP.

THE "Anthony" pump, manufactured by Messrs. Robert Warner & Co. (Engineers), Ltd., Walton-on-the-Naze, has successfully passed through a series of trials recently carried out by the Admiralty officials at one of the Dockyards. The pump has been certified as suitable for service in H.M. Navy, and the manufacturers have been placed on the Admiralty List. This pump has been already described and illustrated in the pages of this journal.

PRIZE COURT.—Sir Samuel Evans, the President, will sit as a Prize Court on and continuously after Wednesday, the 2nd September, 1914 for the hearing of any Prize Causes which may be ready for trial. If before that date the parties in any Prize Cause inform the Admiralty Registrar at the Registry that they are prepared for the trial, the President will at once fix a day for the hearing.

THE FLEETS OF THE NAVAL POWERS.

IN the Comparative Tables, hereafter set out, of the British, friendly and enemy ships of war, only vessels in commission are taken into account, or those which are very near completion, such as in the case of England, the battleships *Emperor of India* (Vickers, Ltd.), *Benbow* (Beardmore & Co.), and the battle cruiser *Tiger* (John Brown & Co.). To the British total is also added the two Turkish battleships, *Sultan Osman I.* (Armstrong, Whitworth & Co.) and *Reshadieh* (Vickers, Ltd.), taken over by the British Government and re-named *Agincourt* and *Erin* respectively. It is interesting to note here that the *Agincourt* was originally laid down to the order of Brazil and bore the name *Rio de Janeiro*, but was bought by the Turks while under construction. Two Scout destroyers, built for the Chilian Government by Messrs. J. Samuel White & Co., have also been taken over by England and named *Faulkner* and *Broke.* These are also included in the tables to the credit of the British ships. The *Faulkner* and *Broke* are the heaviest destroyers in the world. Australian, New Zealand and Canadian ships are included under British.

Class.	Great Britain.			France.			Russia.		
	Ships.	Disp. Tons.	Guns.	Ships	Disp. Tons.	Guns.	Ships.	Disp. Tons.	Guns.
Battleships—									
Modern	26	556,850	228 12" to 13·5"	4	204,988	232 5·5" to 12"	2 (others	34,800 building)	60 4 7" to 12"
Battle Cruisers	10	215,800	80 12" to 13·5"	—	---	—	(4 building)		—
Later Battleships	38	556,200	628 6" to 12"	15	187,290	239 4" to 12"	6	77,974	—
Cruisers—									
1st Class	37	439,800	520 6" to 9 2"	19	197,121	290 4" to 7·6"	6	64,220	114 4·7" to 10"
Light Cruisers	71	342,705	654 4·7" to 6"	11	49,541	†96 4" to 9·4"	16	99,927	—
Destroyers	227	—	—	80	—	—	80	—	—
Torpedo Boats	102	—	—	‡‡153	—	—	18	—	—
Submarines	78	—	—	67	—	—	25	—	—
	589	2,111,355	2,110	349	638 940	857	157	276,921	

Class.	Germany.			Austria-Hungary.			Italy			Japan.		
	Ships.	Disp. Tons.	Guns.	Ships.	Disp. Tons.	Guns.	Ships.	Disp. Tons	Guns.	Ships.	Disp. Tons.	Guns
Battleships—												
Modern	16	308,600	344 6" to 12"	2	40,000	48 6" to 12"	4	84,400	125 4·7" to 12"	7	128,376	162 6" to 12"
Battle Cruisers	4	95,400	82 6" to 12"	—	—	—	—	—	—	1	27,500	24 6" to 14"
Later B'ships	24	271,690	414 4" to 11"	9	98,601	189 4·1" to 12"	8	95,418	136 4·7" to 12"	7	97,600	112 6" to 12"
Cruisers—												
1st Class	9	94,135	132 6" to 9·4"	2	13,725	21 6" to 9·4"	9	74,250	135 4·7" to 10"	11	118,906	222 6" to 12"
Light Cruisers	41	150,062	416 †4·1" to 9 4"	7	23,870	57 4 1" to 7 6"	11	38,148	88 ‡4 7" to 10"	11	54,415	104 4·7" to 8"
Destroyers	152	—	—	18	—	—	36	—	—	54	—	—
Torpedo Boats	45	—	—	87	—	—	85	—	—	55	—	—
Submarines	30	—	—	11	—	—	20	—	—	15	—	—
	321	919,887	1,388	136	176,196	315	173	292,216	484	161	426,797	624

† 9·4" guns on one ship only. ‡‡ Not all effective. ‡ 10" guns on one ship only.
German vessels, *Goeben* and *Breslau*, and the English *Amphion* (sunk), not included.

British Home Fleets Composition. First Fleet. Flag ship, *Iron Duke*; 1st, 2nd and 3rd squadrons, eight battleships each; 4th squadron, three battleships; with cruiser squadrons, as follows: 1st battle cruiser squadron, four ships; 2nd and 3rd squadrons, four ships each; 4th squadron, five ships and eight light cruisers, with destroyers, submarines, etc. Second Fleet, 5th and 6th battleship squadrons, eight and seven ships respectively; 5th and 6th cruiser squadrons, four ships each, two light cruisers, etc.

German High Sea Fleet. Flagship, *Friedrich der Grosse.* 1st squadron, eight ships; 2nd, eight ships; 3rd, four ships. A reserve squadron of four battleships, a battle cruiser squadron of three ships and eight light cruisers.

Russia, Baltic Fleet. Four battleships and five cruisers.

Mediterranean Fleets.—Great Britain, four battleships, four cruisers (armoured) and four light cruisers. France, 1st squadron, eight battleships: 2nd squadron, five battleships, three reserve ships, six cruisers and three light cruisers. Italy, 1st squadron, three battleships; 2nd squadron, two ships; third squadron, two ships, training squadron and two cruiser squadrons of three ships each. Austria, four battleships and three reserve ships.

In Eastern Waters, Britain has one battleship, one battle cruiser, two armoured cruisers and six light cruisers. Germany has two armoured cruisers, and three light cruisers and France, two armoured cruisers.

THE NEW NICLAUSSE MARINE BOILER.

THE Niclausse boiler, of which so many important installations have been made in practically all the navies of the world, in large power-houses and in industrial factories, is too well known by engineers to require a description, so the author proposes to limit this Paper to setting forth briefly the general features and latest improvements.

In the Niclausse boiler all the evaporating tubes are fitted at one end only into the headers, and a perfectly tight joint is ensured by metal-to-metal conical joints. The other end is closed by a cap and is carried by a supporting plate. The removal of any tube, either for cleaning or for replacement, is very easily and rapidly effected, so that a shut-down for any cause does not put the boiler out of service for more than a relatively very short time. The tubes being fixed at one end only, expansion or contraction takes place freely, giving complete security against troubles resulting from neglect of this important provision. It will be noticed from Fig. 1 that the old screwed-on lantern end has been suppressed, the tube being now solid drawn throughout, with swellings to form the cones.

As shown in Fig. 1, each header is divided into two compartments by a vertical partition plate, separating the steam and water currents. The current of water flowing through the front compartment of the header is distributed to each evaporating tube by an inner tube contained in the former. Windows cut in the header end of the evaporating tube enable the water to enter and the steam to depart in two distinct currents, so that positive circulation in only one, and that the correct direction, is ensured.

During the last two years, a number of improvements have been made in the details of the Niclausse boiler, without affecting the principles of its operation and construction. Some years ago the malleable cast-steel curved headers were replaced by headers constructed in solid drawn pressed steel of increased and of rectangular section, and recently the firm introduced a special system of feed distribution to serve the lower tubes, which are those nearest the furnace, and are the principal evaporating tubes. For this purpose, the steam and water drums are divided into two compartments by a longitudinal diaphragm plate in prolongation of the vertical partitions in the headers, as shown in Fig. 2; the feed, after passing through a trough C wherein carbonates and other impurities are precipitated, and whence they are ejected by means of a blow-down valve D, enters at the front compartment, descends the vertical headers for a certain distance determined by a cross diaphragm E, passes into the upper evaporating tubes and returns with the steam there produced into the back compartment of the drum, which consequently contains only hot and purified feed. The purified feed then descends by two tubes placed in front of the side walls, in the case of the high-duty boiler, Fig. 3, into a square horizontal header located longitudinally in

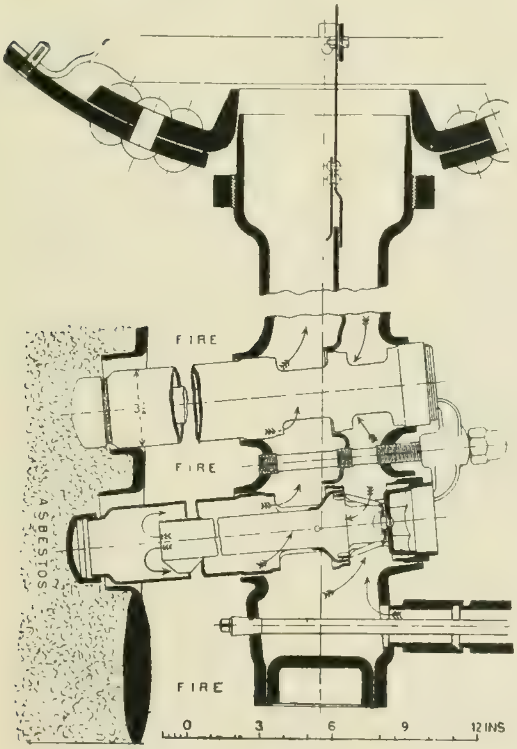

Fig. 1. Header and Evaporating Tube Ends.

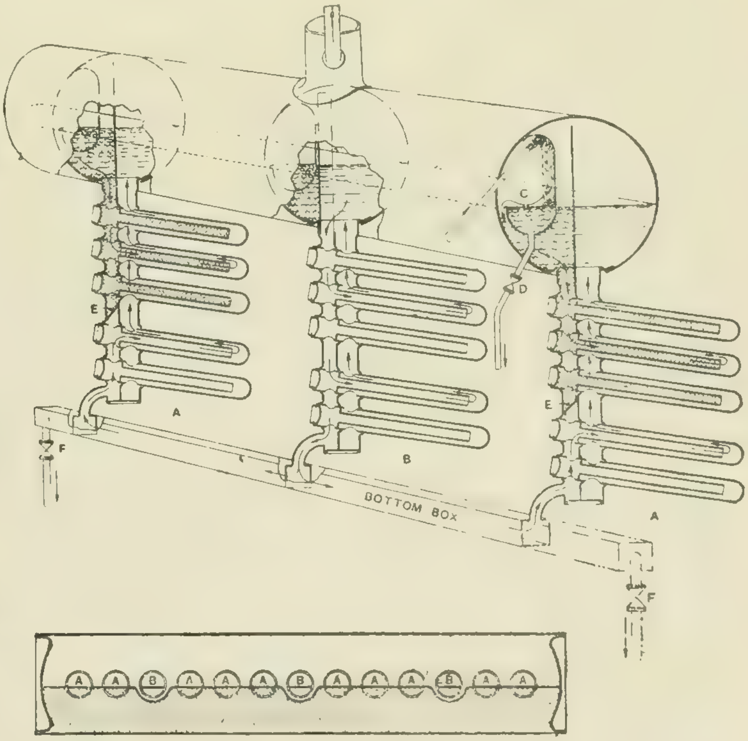

Fig. 2. Diagram of water circulation in land type of boiler.

(Areas covered by small dots represent cold feed-water.)

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*Read at the Paris Meeting of The Institution of Mechanical Engineers.—Mr. Jules Niclausse

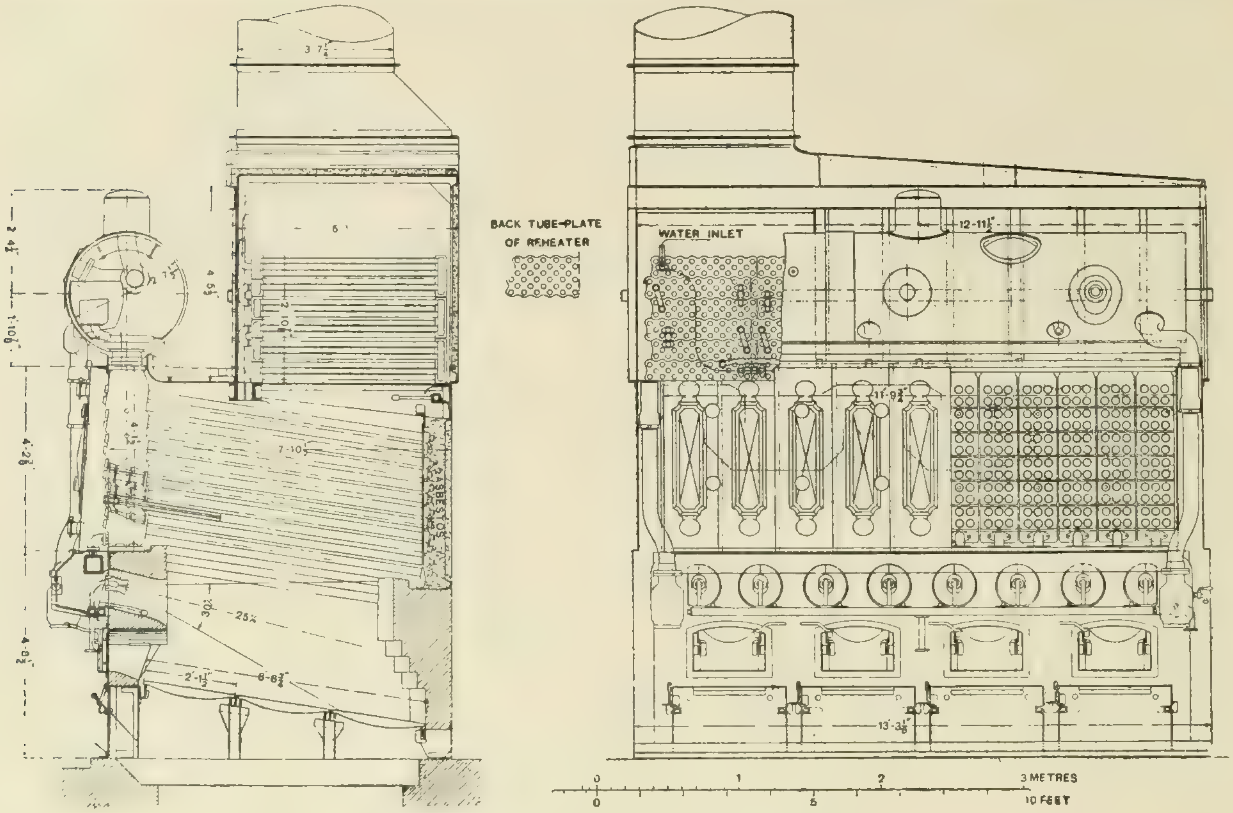

Fig. 3. High duty Marine Boiler for new French battleship *Bearne*.

front of, and connecting by an elbow to the bottom of each of the vertical headers. The upper tubes are therefore fed by relatively cold feed-water, and the bottom tubes by the purified hot feed. The horizontal header also serves as a "bottom box," Fig. 2, whence impurities can also be rejected by blow-down valves F fitted at each end of it.

The lower tubes, which are most exposed to the heat of the furnace, consequently receive the feed at boiler steam temperature and free from any impurities which can cause deposit. Any impurities in the feed to the upper tubes are practically harmless, since the temperature of the gases surrounding them is insufficient to form a hard scale.

In the modern land-type boilers the system is simplified, without impairing its efficiency, by suppressing the vertical downtake pipes. These are replaced by one header out of every four or five, in which no cross diaphragm is fitted in its front compartment, so that it serves to feed the "bottom box" and the lower tubes of all the headers fitted with the cross diaphragm, whilst its own lower tubes are served direct. The arrangement will be quite clear from Fig. 2, A being headers having the cross diaphragm in their front compartment taking impurified feed from the front side of the drum to feed the upper tubes, B being a downtake header taking its hot purified feed-water from the back side of the drum, the division plate therein being suitably arranged for this purpose, as shown at B in plan.

In the new high-duty marine type boiler, the firm have still further increased the section of the headers, chiefly in the rear compartment forming the passage for the steam. This is about 4½ times larger than in the modern land-type headers. Furthermore, an inclination of 15 per cent. instead of 10 per cent. has been given to the tubes, in order to facilitate disengagement of the steam. Also, the outside diameter of the tubes has been reduced from 84 mm. to 60 mm. ($3\frac{5}{16}$ to $2\frac{3}{8}$ inches), a reduction which has been rendered practicable, with complete security against all forms of distress, by the above-mentioned improvements.

The new high-duty boiler is fitted with a feed-reheater placed above the tubes. The water circulates into this apparatus on the contra-flow principle, that is, in the reverse direction to the hot gases. The official tests referred to hereafter show the efficacy of this feed-reheater, as much from the point of view of the feed-water temperature as from that of the chimney-gas temperatures.

The high-duty marine boiler, having no superheater as usually arranged between the tubes in the land type, is fitted with a new system of gas baffling, which doubles the length of the gas flow in the tube "faisceau," ensuring improved utility and efficiency. This comprises plain open-ended tubes laid between the evaporating tubes, forming gas passages, as will be seen from Fig. 3.

All the above improvements were comprised in the test boiler recently tested by the French navy experts. Full dimensions of this boiler are given in the Appendix, together with a drawing showing its general arrangement, Fig. 3. The tests of this boiler by the committee of naval experts appointed by the French Admiralty, and carried out in September last, comprised :—

(1) A six-hour trial at the combustion rate of 95 kilograms of coal per square metre of grate surface (19·5 lb. per square foot). The evaporation in lb. from and at 212° F. was 13·1 per lb. of coal fired, the thermal efficiency being 91·5 per cent., and the capacity, 20,000 lb. per hour from and at 212° F.

(2) A six-hour trial at the combustion rate of 180 kilograms of coal per square metre of grate surface (37 lb. per square foot). The evaporation in lb. from and at 212° F. was 11·5 per lb. of coal fired, the thermal efficiency being 79·8 per cent.

(3) A sixteen-hour trial at the combustion rate of 225 kilograms of coal per square metre of grate surface (46 lb. per square foot). The evaporation in lb. from and at 212° F. was 11·4 per lb. of coal fired, the thermal efficiency being 79·3 per cent., and the capacity 41,000 lb. per hour from and at 212° F.

(4) A four-hour trial at the combustion rate of 135 kilograms of petroleum per square metre of grate surface. The evaporation in lb. from and at 212° F. was 15·5 per lb. of fuel burnt, the efficiency being 78·8 per cent.

(5) A five-hour trial to demonstrate the elasticity of the boiler. Operation took place as follows:—Half an hour at the combustion rate of 95 kilograms per square metre of grate surface; half an hour at the combustion rate of 180 kilograms; half an hour at combustion rate of 225 kilograms; one hour at the combustion rate of 240 kilograms; a quarter of an hour at the combustion rate of 180 kilograms; a quarter of an hour stop; ten minutes at the combustion rate of 95 kilograms; three-quarters of an hour at the combustion rate of 135 kilograms with oil fuel; a quarter of an hour at the combustion rate of 95 kilograms of coal. This trial proved that the boiler made the change from these different rates with perfect success, and without any difficulty.

Further tests were made on the 6th January last, by a party of English engineers. The results fully corroborated those obtained by the French naval experts.

During the No. 3 trials, the percentage of water entrained was at maximum only 0·9 per cent. This was determined by the salt method with the Kennedy apparatus. The maximum temperature of the gases at foot of chimney was only 330° C. (625° F.) during the sixteen-hour test at the combustion rate of 225 kilograms per sq. metre (46 lb. per sq. ft.), when the evaporation was 105 per cent. above the normal. It must be added that the feed-water used was the ordinary town water, which was not in any way treated or purified, and which during the official tests was subjected to an addition of such a quantity of sea salt as to give one degree of salinity to the water in the boiler. Valvoline was also added in the proportion of 175 grammes per ton of coal fired. On the results of the tests made by naval experts in September last, the French Admiralty placed with the firm an order for twenty-one boilers, aggregating 36,000 h.p. for the 25,000-ton super-Dreadnought *Bearne* laid down on the 1st January of this year.

For land service, the new high-duty boiler is arranged in much the same manner as in the Niclausse land type, and is fitted with super-heater and mecha-

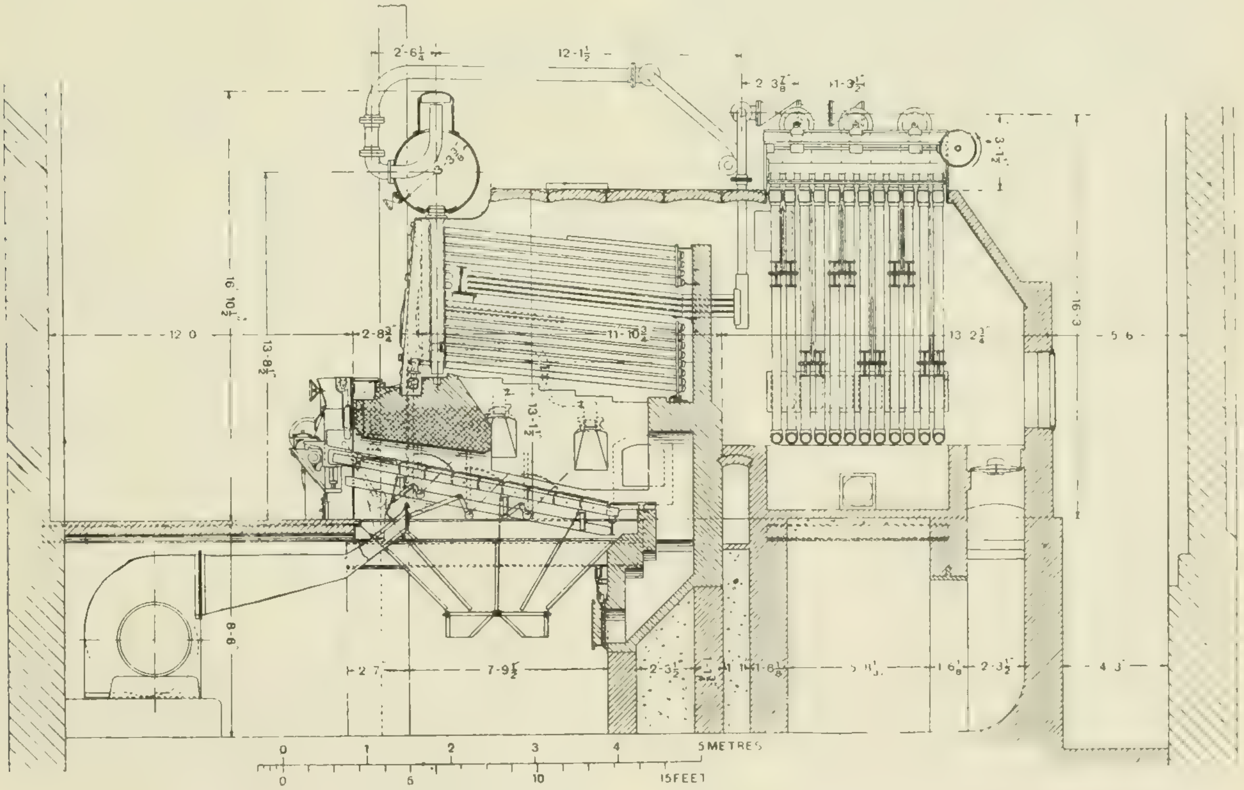

Fig. 4. Cross sectional elevation of Southend boilers.

nical stoker, both of the firm's design and make. The superheater is constructed of several serpentine sections interpolated and coupled to two headers, one at the entrance and the other at the steam exit. The serpentines, which are placed within the nest of tubes in the latter, are located above the "faisceau" in the new high-duty type boiler for land service.

The Niclausse mechanical stoker comprises firebars in short sections interlocking each other and carried in supporting bearers, which are given an intermittent to-and-fro motion, so that two adjacent bars always work in opposite directions. There is a momentary cessation between the movement backwards and forwards. The bar movement is effected by means of a slowly rotating shaft mounted with hard steel cams, which engage with hard steel trip pieces mounted on the bearer heads. The speed of the driving shaft can be varied from one to six revs. per minute. Below the grate are fitted a series of hoppers serving as both air-ducts and ash-pits. The air supply is furnished preferably by a forced draught fan worked at low pressure. This system is very much more economical than either the induced or ejector draught systems. The ash-pit is divided into three compartments, in which the air supply is regulated independently to the different zones of the fire-bed, whereby perfect combustion with any kind of fuel is ensured. The ash-pit compartments also serve to separate green fuel riddlings from the fine ashes, the former being trapped in the front compartment and the latter in the rear compartment, whilst the clinkers are delivered into a capacious hopper under the end of the grate. The Niclausse stoker, of which there are over 200,000 h.p. at work, has been proved capable of burning all classes of solid fuels from coke breeze and coals having only 8 per cent. volatile matter to the coals richest in volatile matters. Recently, it has been tried in England with very high volatile Midland coal, and in South Wales with extremely low grade, low volatile, high ash Welsh coal, with successful results.

Fig 4 illustrates the arrangement of the stoker, also the superheater, with respect to the boiler, as instanced in the recent installation of two 25,000 to 35,000 lb. per hour boilers, complete with stokers, etc., at the Corporation Electricity Works of Southend-on-Sea in England.

APPENDIX.

Particulars of the Boiler submitted for Trials by the Navy.

The general arrangement of the boiler is shown in Fig. 3. Other particulars are as follows:—

Working pressure (gauge)	18 kg per sq. cm (256 lb. per sq. in)
Number of headers ..	13
Number of evaporating tubes, upper	300 (thickness 2½ mm. (0 099 in.))
Number of evaporating tubes, lower	156 (thickness 4 mm. (0·16 in.))
Total number of tubes ..	456
Cleaning of tubes ..	12
Outside and inside diameter of upper tubes, mm. ..	60 × 55 (2·36 in. × 2·16 in.)
Outside and inside diameter of lower tubes, mm. ..	60 × 52 (2·36 in. × 2·04 in.)
Height of headers	2 300 m = 7 ft. 6 in
Length of tubes projecting outside the headers ..	2·020m = 6 ft 7¼ ins.
Number of tubes in economizer	780
Length of economizer tubes (outside headers) ..	1 216 m = 4 ft. 0 ins
Length of grate	2·000 m. = 6 ft. 6 ins.
Width of grate	3 600 m. = 11 ft. 9½ ins.
Grate area	$7·20m^2$ = 77·5 sq. ft.
Heating surface of outer tubes	$173·62m^2$ = 1,870 sq. ft.
Heating surface of economizer	$119·22m^2$ = 1 285 sq. ft.
Total heating surface ..	$292·85m^2$ = 3,155 sq. ft.
The ratio of outer heating surface of the tubes (neglecting the header surface) to the grate surface is:	
Outer surface of evaporating tubes	24·11 to 1
Outer surface of economizer tubes	16·56 to 1
Ratia of total heating surface to grate area	40·67 to 1

Space occupied by boiler = 114 sq. ft., height to top of dome 13 ft.

Hourly evaporation per sq. ft. of ground space occupied:

(*a*) At normal load, with rate of combustion of 19·5 lb. per sq. ft. of grate surface = 175 lb. per hour from and at 212° F.

(*b*) At overload, with rate of combustion of 46 lb. per sq. ft. of grate surface = 355 lb. per hour from and at 212° F.

REVIEWS.

The Naval Annual for 1914. London. Wm. Clowes & Sons, Ltd. Price 12/6 nett.

THE publication of Brassey's Naval Annual is always awaited with interest by those connected with naval matters. The volume enjoys the capable editorship of Viscount Hythe, who, in turn, has been considerably assisted in the duties of editorship by Mr. Leyland and Commander Robinson. Mr. Leyland is wholly responsible for the review of the progress of foreign navies and Commander Robinson reviews as usual the progress of armour and ordnance (Part III.), and also contributes a chapter on the naval events of the Balkan War. The book, though up to its usual standard, is slightly reduced in bulk, owing to the omission in Part IV. of some of the official papers which have been formerly included in this section. We are told in the preface why there has been a change of publishers and the reason for the slightly reduced size of the publication. Nothing has been done, however, to impair the usual features of the book, for there can be little information, connected with naval matters, not mentioned in the volume. The naval student is well catered for. We find chapters on Wireless Telegraphy in the Navy, British and Foreign Air-craft, German dockyards, Naval Literature, etc. The chapter and tables of comparative strength of British and foreign warships are by the Editor, who has also written, in conjunction with Mr. Leyland, that part of the book dealing with the progress of the British Navy. The right of capture in maritime war forms the subject of an interesting chapter by Vice-Admiral Sir Edmond Slade, and Mr. Alex. Richardson deals with the influence of loads on ships' speeds. Commander Robinson and Mr. Leyland are responsible for the very complete list of British and foreign warships. Part III. contains particulars of the British and Foreign Navy Estimates. The book is well illustrated, printed and bound and is in its 28th year of publication.

The Journal of the Institute of Metals (Volume XI.). Edited by G. Shaw Scott, M.Sc. The Institute of Metals, Caxton House, Westminster, S.W. Price 21/- nett.

THE latest volume of the Journal of the Institute of Metals is as replete with scientific and practical information regarding the non-ferrous metals as any of its predecessors. Within its green cloth-bound covers there are 437 pages and sixteen plates, the bulk of the matter consisting of the papers read at the recent London meeting of the Institute and the discussion on these papers. Admiral Sir Henry J. Oram, K.C.B., F.R.S., Engineer-in-Chief of the Fleet, delivered a remarkably informing presidential address at the London meeting, and this is reproduced in full in the present volume.

Here we have a first-hand account of how the Admiralty have tackled and successfully solved many complicated engineering problems. Important reports of two of the Institute's Committees are reproduced in full, these being the first report to the Beilby Research Committee (dealing with the solidification of metals from the liquid state), and the first report of the Nomenclature Committee, which suggests a rational means of naming alloys. The volume concludes with a very full summary of the world's metallurgical literature of the past six months, in a study of which, as well as of the rest of the volume, the reader is greatly helped by an exceedingly complete index.

Ships and Shipping. Two vols. 1/- each. London: Thomas Nelson & Sons.

These two volumes, recently issued by Thos. Nelson & Sons, for their Encyclopædic Library Series, are well written popular books and crowded with information. Volume I., comprising nearly 400 pages, contains chapters on the "Development of the Ship from Earliest Times," written by Mr. Keble Chatterton. Professor Welch writes on the subject of "The Theory of the Design of Ships and the building of Ships." Boilers and condensers, marine engines of all types, shafting and steering gears, motor-driven boats and ships are all dealt with in this volume, and Mr. Brysson Cunningham has a chapter on "Engineering Work in Ports, Harbours and Docks." Canals, dredging and marine surveying, the latter subject by Captain Tizard, R.N., are also dealt with. Volume II. contains 350 pages. Mr. Keble Chatterton writes on "Seamanship and Navigation and Yachts and Yachting," Mr. Rd. Fletcher on "Flags, Signalling and Ships' Lights"; "Wireless Telegraphy"; "Protection and Saving of Life at Sea"; "The Working of a Ship"; and "the Merchant Service as a Career." Other subjects elucidated for the benefit of the reader are "Ship Insurance," "Measurement and Capacity of Ships"; "Ships' Papers"; "Freeboard"; "Shipping Dues," "Shipping Routes," etc. This volume has a nautical glossary compiled by Mr. Chatterton. Each volume ends with an index. It will be seen that for the small outlay a comprehensive work is obtained, well printed and bound, and full of interesting instructive matter suitable for the person wishing to acquaint himself with maritime matters.

Seaton & Rounthwaite's Pocket Book of Marine Engineering Rules and Tables. London: Charles Griffin & Co., Ltd. 8/6 nett.

This well-known publication, first issued in 1893 and prepared for the use of marine engineers, naval architects, designers, draughtsmen, superintendents and all engaged in the design, construction and care of marine machinery, both naval and mercantile, is now in its 12th edition. That the work has passed into twelve editions since its first appearance in 1893 speaks well for the cordial reception and support it receives from all those persons engaged in the shipbuilding, marine engineering and allied industries. In this edition, in regard to bringing the book up to date, the treatment has been more drastic than that accorded to previous editions. The conditions of marine engineering have so changed since the work was first published in 1893 that a great demand has been added for things not then contemplated. All the tables in the present edition have been brought up to present practice, the new rules of the Board of Trade and the numerous modifications of the classification societies have all been embodied. Fresh tables and considerable additional information have been added, increasing the number of pages to over 700. Well bound and printed the work can be confidently recommended as a first-class publication for the marine engineer and naval architect.

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HULL.—*1st Class:* H. Collinson, A. Wilson. *2nd Class:* J. E. Bell, T. W. Gee, H. D. Lyon, G. Shaw, E. Wilson.

DUNDEE.—*1st Class:* A. D. Beveridge, W. Johnston, J. C. B. Smollett, C. C. Will.

JULY 23rd, 1914.—LONDON.—*1st Class:* T. Fyall, A. Salter, D. Soutar. *2nd Class:* H. Atkinson, J. Key, A. Lea, E. Lees, J. Seare, N. Seaton.

CARDIFF.—*1st Class:* M. Kypriadis, R. Moncrieff. *2nd Class:* H. Bettis, T. Griffin, M. Henderson, R. Thomas.

GLASGOW.—*1st Class:* J. Ferrie, J. McQuarrie, J. Montgomery, A. Smith. *2nd Class:* W. Fullerton, J. McIlwain, T. McUtchen, J. Matheson, J. Millar, A. Paul, J. Taylor, W. Windsor.

LIVERPOOL.—*1st Class:* D. Chase, J. Kay, G. Rogers, F. Watts. *2nd Class:* W. Clay, A. Wright.

WEST HARTLEPOOL.—*1st Class:* W. Doyle, A. McHard, T. Richardson, V. Wilson. *2nd Class:* E. Banks, T. Holbrook, J. McBeath.

NORTH SHIELDS.—*1st Class:* J. Dove, E. Kennedy. *2nd Class:* G. McQuillen, W. Swinney.

SOUTHAMPTON.—*1st Class:* J. Raffray. *2nd Class:* J. Hobbs, W. Wager, W. Willis.

LEITH.—*1st Class:* J. Cumming, J. Downie, R. Gibson, A. Smith.

JULY 30th.—LONDON.—*Ex. 1st Class:* J. Arbuckle. *1st Class:* E. Ayerst, W. Bailey, H. Cliffe, G. Derry, W. Nicholas, R. Rennell, F. South, D. Wallace. *2nd Class:* A. Widgery.

HULL.—*2nd Class:* J. Bell, J. Johnson.

NORTH SHIELDS.—*1st Class:* W. Douglas. *2nd Class:* W. Agate, J. Fellowes, H. Lacey, W. McGowan, J. Mackey, A. Wilson, T. Wright.

GREENOCK.—*1st Class:* D. Mackintosh, M. Mowat, S. Wallace. *2nd Class:* J. Paterson, A. White.

ABERDEEN.—*1st Class:* D. Macbean, R. McIntosh, W. Rennie, J. Smith. *2nd Class:* J. Gordon.

LIVERPOOL.—*1st Class:* G. Bebbington, H. Berry, H. Glennie, W. Jackson, H. Lockhart, H. Nelson, J. Trousdale. *2nd Class:* D. Baxendell, F. Denton, R. Hamerton, D. Houston, C. Jackson, H. Mawdsley, W. Owens, W. Reid, J. Stewart.

SUNDERLAND.—*Ex. 1st Class:* R. Moffitt. *1st Class:* W. Phorson, A. Scott. *2nd Class:* W. Bell, R. Dickinson, J. Esdon, H. Pace, J. Ranson, W. Smith, L. Trewhitt.

LEITH.—*Ex. 1st Class:* M. Dallas.

NORTH SHIELDS.—*Ex. 1st Class:* J. Allan, A. Harbottle, W. Ridley.

BRISTOL.—*1st Class:* J. Roberts.

AUGUST 6th, 1914.—LONDON.—*1st Class:* H. Garnett, J. Inglis, D. Smith. *2nd Class:* D. Lawrie, L. Sutton.

SOUTHAMPTON.—*1st Class:* W. Sharland, E. Smith. *2nd Class:* D. Chalk.

BELFAST.—*1st Class:* R. James, W. Moore.

NORTH SHIELDS.—*1st Class:* F. Pinder. *2nd Class:* G. Carter, T. Fraser, H. Lloyd.

GLASGOW. *Ex. 1st Class:* N. Gebbie, W. Stott. *1st Class:* D. Duncan, W. Fry, W. Liver, H. McKie, A. McNeill, W. Nicol. *2ud Class:* W. Reid, G. Todd.

LIVERPOOL.—*Ex. 1st Class:* F. McNair, M. Shand. *1st Class:* W. Fairhurst, G. Gardner, W. Richardson. *2nd Class:* H. Blain, W. Cuthell, R. Davidson, W. Fairgrieve, G. Harris, W. Hillen, W. Kelly, D. Mansfield, G. Stenhouse, J. Titchmarsh.

CARDIFF.—*1st Class:* N. Bastian, J. Duncan, E. Hodges, E. Lewis, E. Rees. *2nd Class:* J. Hopkin, W. Jones, A. Manning.

LEITH.—*1st Class:* J. Duncan, G. McBain.

AUGUST 13th, 1914.—LONDON.—*1st Class:* P. Collett, H. Green, D. McDougall. *2nd Class:* J. Davis, A. Evans.

HULL.—*1st Class:* W. Gillmore.

GREENOCK.—*1st Class:* J. Briggs, W. Grant, M. McVean. *2nd Class:* R. Fraser, T. Symons.

LIVERPOOL.—*1st Class:* P. Douglas, G. Parker, C. Rothery, T. Thomas. *2nd Class:* J. Aitken, R. Lewis, A. Murray, D. Wilson.

NORTH SHIELDS.—*1st Class:* N. Featonby, E. Gilderoy. *2nd Class:* C. Latimer, J. Pearson, J. Westergaard.

AUGUST 20th, 1914.—LONDON.—*1st Class:* E. Clark, C. MacDonald, A. Pinch, H. Weeden, S. Woodrow. *2nd Class:* J. Annal, E. Farrow, H. Pett, F. Platt.

CORK.—*2nd Class:* N. Sunner.

GLASGOW.—*1st Class:* J. Borland, D. Campbell, J. Hamilton, J. McDonald, C. Mackenzie, R. Ramsay. *2nd Class:* C. Drummond, E. Greig, J. Lochhead, G. McLeod, F. Smart, J. Wilson.

LEITH.—*1st Class:* R. Lowe, C. Macnee, W. Monro, F. Russell, D. Spalding. *2nd Class:* T. Patterson, D. Robb.

SOUTHAMPTON.—*1st Class:* E. Stedman, A. Turner, E. Wallis.

LIVERPOOL.—*1st Class:* J. Daykin, J. Ellwood, J. Little, T. McCullagh, H. Parker, T. Taylor. *2nd Class:* R. Bruce, H. Cheetham, W. Goff, A. McKellar, M. O'Hanrahan, C. Speakman, C. Turner, E. Wells.

CARDIFF.—*1st Class:* J. Baker, R. Charles, W. Jenkins, W. Sturdy. *2nd Class:* A. Barnicoat, C. Georges, F. Lane, F. Northam, J. Tweedy.

NORTH SHIELDS.—*1st Class:* W. Charlton, R. Marshall, W. Walton. *2nd Class:* J. Fraser, W. Hall, G. Miller, D. Mitchell.

WEST HARTLEPOOL.—*1st Class:* R. Hunter, H. Weaver. *2nd Class:* B. Colclough.

We hear that the Sirius Autogenous Works Co., of 85 and 87, High Street, Stratford, London, E., the well-known oxy-acetylene welding plant manufucturers, have secured the order from the Schmidt's Superheating Co., Ltd., for a complete oxy-acetylene welding plant for their new works at Trafford Park, Manchester. The generating plant is of the same capacity as that recently supplied by the Sirius Autogenous Works Co. to the British Westinghouse Electric and Manufacturing Co., Ltd., of Manchester. These plants will be the two largest automatic acetylene generators in this country.

DEVELOPMENT OF INTERNAL-COMBUSTION ENGINES FOR MARINE PURPOSES.*

MESSRS. Schneider & Co. have for some years specialized in the construction of oil-engines working on the Diesel principle. They concentrated their efforts at first on four-stroke cycle engines specially designed for submarines for the French Navy or for foreign navies, but they very soon found that the two-stroke cycle type might be of great use for engines of medium and of high power, both as regards reduction in weight and bulk, as well as for improvement in cyclic regularity. They therefore had no hesitation in studying and constructing that type of engine together with the four-stroke cycle one. Being, on the other hand, aware of the fact that it was not advisable to start on this new line without precise data on the advantages of the two-stroke cycle, derived from their own experience, they faced the heavy cost of erecting a couple of two-stroke cycle engines at the works for trial purposes. These were vertical and with a single cylinder. One had a stroke of one metre (3 feet 3·37 inches), and developed 1,200 h.p. at 150 revolutions per minute. The other had a stroke of 0·46 metre (1 foot 6·11 inches) and developed 300 h.p. at 400 revolutions per minute. These engines were to give an idea of the difficulties in regulating and running engines of large size or at high speed, so that means could be found to remedy any defects that might arise. The results enabled the constructors to start with confidence on the difficult solution of the problem relating to high-speed, two-stroke cycle light engines for submarines, and placed them in the foremost technical position to solve the problem of the use of large oil-engines for ordinary vessels. The experiments took place over a period of two years.

The two-stroke cycle engines—like the four-stroke cycle—are mostly light engines, of relatively high horse-power, built for marine work. On the other hand, the constructors did not lose sight of the development of heavy slow speed engines (four-stroke cycle or two-stroke cycle) for cargo boats or of horizontal double-acting engines of high horse-power for land purposes. Their great experience in the construction of engines for land and sea placed them in such a position that they could safely set to work in executing their new designs, and to-day they are able to deal with all the intricacies of Diesel engines, either of the land or marine type, two-stroke cycle or four-stroke cycle, vertical or horizontal, and single or double-acting.

These engines have been highly successful, due to the excellence of construction and the materials used, the original design of the mechanism, and the care taken in perfecting them.

The following engines constructed at their works are worthy of note:—(*a*) Eight engines of 360 h.p. each, four-stroke cycle, with eight cylinders, stroke 0·28 metre (11·02 inches), 400 revolutions per minute, for submarines of the Laubeuf type. (*b*) Two engines of 700 h.p. each, four-stroke cycle, with four cylinders, stroke 0·48 metre (18·9 inches), 300 revolutions per minute, and two motors of 150 h.p., four-stroke cycle, with four cylinders, 360 revolutions per minute, representing the main and auxiliary engines of the French submarine *Amiral Bourgois*. (*c*) Two engines of 900 h.p. each, two-stroke cycle, with four cylinders, stroke 0·56 metre (22·05 inches), 230 revolutions per minute, for the cargo boat *France*, belonging to the "Société des Navires Mixtes," of Rouen. (*d*) Two engines of 2,400 h.p. each, two-stroke cycle, with eight cylinders, stroke 0·47 metre (18·51 inches), 350 revolutions per minute, for the French submarine *Nereide*. (*e*) Six engines of 650 h.p. each, two-stroke cycle, with six cylinders, stroke 0·36 metre (14·17 inches), 400 revolutions per minute, for a French submarine. (*f*) Eight engines of 1,100 h.p. each, two-stroke cycle, with eight cylinders, stroke 0·37 metre (14·57 inches), 400 revolutions per minute, for submarines of the Laubeuf type. (*g*) One engine for an electric generating set of 225-250 h.p., two-stroke cycle, with three cylinders, stroke 0·36 metre (14·17 inches), 300 revolutions per minute. It must be remarked that the submarines of the Laubeuf type come from Messrs. Schneider & Co.'s naval works. Other engines in course of design or of construction may be mentioned:—Four engines of 510 h.p., four-stroke cycle, for submarines; one engine of 1,500 h.p. for a cargo boat; one horizontal tandem engine, double-acting four-stroke cycle of 2,200-2,600 h.p. for an electric generating station; and two-stroke cycle engines of 1,100 h.p. for submarines.

All the engines for submarines, whether four-stroke cycle or two-stroke cycle, are extra light. They are vertical, single-acting, with trunk pistons. The bed-plates and frames are of cast steel; the cylinders, which are either separate or cast with the frames, are of cast iron or cast steel with cast-iron liners. The cylinder cover is of cast steel and carries (for four-stroke cycle engines) the inlet valve, the exhaust valve, the injection valve for fuel and starting valve. For two-stroke cycle engines the air and exhaust valves are replaced by scavenging valves.

The crank and cam-shafts are of medium hard steel, which is tempered and annealed, and all the parts subjected to hard wear, such as cams, rollers, valves, pins, compressor valves, etc., are in special steel.

The air-inlet and exhaust pipes (the latter having water-jackets) are of sheet steel. All parts exposed to heat, such as the cylinders, cylinder covers, exhaust-valve seats and exhaust pipes are water-jacketed. For the four-stroke and the two-stroke engines of large size the pistons are cooled by oil circulation.

The crank-pins and crank-shaft bearings, the cylinders and other main working parts have forced lubrication.

The air-compressors, and for the two-stroke engines the air-compressors and scavenger pumps (whether separate or forming part of the engine), are worked directly off the crank-shaft, which in many cases also works the oil pumps for lubricating and cooling, as well as the pump for the water circulation. All these devices are practically the same for heavy engines, except that for the latter the bed-plates, frames and cylinders are of cast-iron, and the pistons are provided with rods and cross-heads in engines of larger size.

(To be continued.)

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*Read by M. Drosne of Messrs. Schneider & Co., Paris. Translated.

PRODUCTION OF MINERAL OIL.

IN a paper dealing with the "Economics of Marine Fuel,"* and read before Section F (Economics and Statistics) of the British Association in Australia last month by Professor A. W. Kirkaldy, the professor says: The total world production of mineral oil is about 48,000,000 metric tons, but this has to be refined before it is available either in the form of petrol for motors, paraffin for lighting, or the heavy oils for engine purposes. It has been estimated that the present war and mercantile navies of the world, if they used oil fuel exclusively, would consume about 25,000,000 tons annually; which quantity could only be procured by greatly increasing the present production, or so greatly forcing up the price as to render it economically impossible to employ oil fuel. If, however, one takes stock of the world's resources, and notes how the growing demand for oil in its various constituents, has increased the production, there is good reason for believing that in a not very remote future, should the shipping managers of the world decide on operating their vessels with oil, the quantity required will be forthcoming at a reasonable price. Since the year 1901, the production of oil has considerably more than doubled. In that year the quantity produced was only a trifle over 21,000,000 tons. If this rate of increase can be maintained the time when oil may supplant coal at sea is not very far off. And be it noted this figure only includes oil mined in the fluid state; the quantity that could be distilled from coals and shales has not been estimated, but undoubtedly it is very great. Increased demand and the economic conditions of the various spheres of transport will render this further supply available in due course. For our own Navy, the Naval Oil Fuel Commission has been at work, and what has been attained for British warships is now public property. Sufficient is already known to warrant the assertion that an adequate supply of oil for the Navy has been arranged for at a maximum price that promises to show an economy over coal, and at a possible minimum price which should prove of considerable benefit to the taxpayer. The results of expert researches submitted to the Commission will, when made public, go far to prove that the fears expressed as to the world's resources of this valuable means of producing power were groundless. One cannot insist too emphatically on the point that when the facts are proved, the country that is the first to utilise oil on a large scale for shipping purposes will have an enormous advantage over any competitors who lag behind.

NICLAUSSE BOILERS.—It is interesting to note that the St. Pancras Borough Council have awarded to the British Niclausse Boiler Co., Ltd., Caxton House, Westminster, the contract for four boilers, complete with Niclausse stokers, superheaters and economizers, fitted with forced and induced draught plant, chimneys and other accessories. Each unit is to be capable of evaporating 40,000 lbs. of steam per hour from feed at 120 deg. F., at steam pressure of 220 lbs., superheated 250 deg. F. The first boiler is to be erected by the end of the present year, which the British Niclausse Boiler Co. intend to do, notwithstanding the present international situation.

BOILER EXPLOSION.

REPORT No. 2267, dealing with an explosion from the main boiler on board the coasting steamer *Burnock*, states that the boiler is made of steel and is fitted with iron smoke tubes. It is of the ordinary single-ended marine type, with two plain welded furnaces, and separate combustion chambers. The crown of the port combustion chamber collapsed, forcing the nuts off ten of the stays which supported the plate. The plate was also forced over the ends of the stays and the steam and water escaped through the stay holes. The upper flanges of the tube plate and the combustion chamber back plate were set down and the holes for the two top rows of tubes were flattened considerably. The crown plate of the starboard combustion chamber was also buckled, and the holes for several of the top row of tubes were distorted, the flanges of the back tube plate and the combustion chamber back plate being also set down. The Engineer Surveyor-in-Chief, in commenting on the explosion, says:—The main boiler of this vessel became short of water, in consequence of which the crowns of the combustion chambers became overheated, one of them collapsing and causing the disablement of the ship. The engine man on watch stated in evidence that the water had risen slowly in the gauge-glass until it passed out of sight above the upper nut. Being under the impression that the condenser was leaking and the boiler too full of water, he opened the blow-down cocks and blew water out for a period of about seven minutes. The water-level did not, however, re-appear and some little time afterwards the explosion occurred. It is clear that the water gauge was not working properly, and it is equally clear that this fact should have been discovered by the engine man if he had known how to test the water gauge properly. After the vessel arrived in the Tyne the water-gauge fittings were examined and found to be clear; and, if they were in this condition at the time of the explosion, it is evident that one of the valves on the water gauge was shut, probably one of the two lower ones, the water level in the glass rising as the steam in the upper pipe condensed. The engine man and stoker were, fortunately, able to escape from the engine-room without injury from the escaping steam; but the vessel was quite disabled. The explosion from the boiler and disablement of the vessel might, in this case, have been prevented if the engine man had understood the proper working of the water-gauge fitting.

WRECK STATISTICS FOR 1913.

THE statistical summary of vessels totally lost, broken up, condemned, etc., now published by Lloyd's Register, shows that, during 1913, the gross reduction in the effective mercantile marine of the world amounted to 665 vessels of 717,030 tons, excluding all vessels of less than 100 tons. Of this total, 371 vessels of 533,002 tons were steamers, and 294 of 184,028 tons were sailing vessels. These figures, as regards steamers, are lower than those for 1912 by 39,543 tons; but as regards sailing vessels, they are for the year 1913 somewhat higher, *viz.*, by 7,808 tons. One of the most common terminations of a vessel's career is breaking up, dismantling, etc. (not in consequence of casualty). The amount of tonnage so dealt with in 1913 was 108,795 tons, this being 48,846 tons less than that for 1912. Nearly 20½ per cent. of the steamers and 16 per cent. of the sailing vessels removed from the Merchant Fleets of the world in the course of 1913 are accounted for in this manner. Of the total tonnage of such cases 42¾ per cent. is represented by United Kingdom vessels. The statistical tables exhibit interesting data as to the relative frequency of the different kinds of casualty, etc., which conclude the existence of vessels. Strandings and kindred casualties which are comprised under the term "wrecked," are much the most prolific cause of disaster. To such casualties are attributable over 58½ per cent. of the losses of steamers, and over 54 per cent. of sailing vessels. Cases of abandoned, foundered and missing vessels are no doubt frequently more or less similar in the circumstances of loss. If these be taken collectively, they form about 21¾ per cent. of the steamers, and over 29 per cent. of the sailing vessels removed from the mercantile marine during 1913, owing to casualty.

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* This paper is excerpted from a book by the author on the "History and Economics of Transport," which is to be shortly published by Sir Isaac Pitman & Sons, Ltd.

Industrial and Trade Notes.

THE CLYDE AND SCOTLAND.

(From our Own Correspondent.)

The War and Industry.—The declaration of war made early in August by Britain against Germany—and subsequently against Austria—arising out of the situation in Europe, had the immediate effect of upsetting and to some extent paralysing industry and trade throughout Scotland, as in other sections of the kingdom. The Clyde and other industrial centres have, of course, been acutely shaken, and working staffs in all departments have been seriously diminished, where indeed there has not been complete stoppage of works. The blow was at first stunning, but time and the course of events have brought about more calmness and settled effort. Shipbuilding and engineering works and the various subsidiary industries have to a large extent had to yield up a goodly percentage of their working forces to the Nation's needs for war service, but the calls in this way, of course, have been coincident with a slowing down of operations on the work on hand—at least as regards mercantile shipbuilding. There has been a very general and generous recognition on the part of employers of the hardships which families may have to sustain through the absence of breadwinners. Wage allowances have been made and pledges given as to re-instatement when war necessities abate.

Mercantile Shipbuilding.—Mercantile shipbuilding is being affected adversely in a number of ways. A number of establishments have had to slow down and dismiss hands. It is suffering or certainly will suffer, from the financial stringency brought about by the widespread conflict. Already, owing to the state of the money market a number of firms find it difficult to continue operations at anything like normal pace. When matters become worse all the yards, except those engaged in building new and repairing naval ships, may have to close down altogether. A goodly proportion of the merchant tonnage under construction is for countries which are more or less seriously affected by the European situation and neither owners nor builders are anxious that the work should be completed in a hurry. Again a large proportion of the merchant ships under construction even for home owners are being built with borrowed money and if credit is unobtainable or if it can be secured only at abnormally high rates the restriction of operations must necessarily follow. The month of August, at least, has little to show in the way of mercantile tonnage launched. At a conference held in Glasgow on August 14th, between representatives of the Clyde shipbuilding and engineering employers, the question of working short time in view of the lack of employment during the war was considered. As the conditions in the different yards and shops vary so much it was agreed that each firm should act for itself, but that each should keep working as long as possible, so that any slackening down found to be necessary would be gradual and cause the minimum amount of unemployment.

Naval Shipbuilding.—While this indicates the situation as regards mercantile shipbuilding and engineering it is far otherwise with regard to naval work, in which as it happens the Clyde establishments are richer than at any other previous time. At Admiralty instigation and advice there has been a very decided speeding-up in the fitting out of certain war vessels nearing completion and large squads of men have been working overtime (even on Sundays), not only on board the vessels, but in the works of sub-contractors who supply accessories such as pumps, valves, motors, compasses, range finders, etc. The entrances to and boundaries of all works in which Admiralty contracts are on hand have been effectively patrolled night and day by Territorials. Work has, of course, been also expedited on naval ships still on the stocks. Three of the firms on the Clyde have each two Dreadnoughts in hand. The Fairfield Company have the battleships *Valiant* and *Renown*; Messrs. John Brown & Co., the Dreadnought cruiser *Tiger* and the battleship *Barham*, and Messrs. Wm. Beardmore & Co., the battleships *Benbow* and *Ramillies*. In addition there are four fast protected cruisers at advanced stages of construction; the *Undaunted* in Fairfield fitting-out basin, the *Galatea* and *Inconstant* in the Dalmuir basin, and the *Royalist* well forward on the stocks at Dalmuir. Full information has been obtained by the Admiralty regarding the capacity of the Clyde shipyards to undertake naval repair work and arrangements have been made for the transfer of bodies of workmen from one yard to another as construction or repair work demands.

THE TYNE AND WEAR.

The Tyne.

(From our Own Correspondent.)

SHIPBUILDING activity has never been greater on the Tyne than during this past month, but it is in the direction of naval work that the main energy has been centred. All classes of builders and workers have agreed to forward in every way the work of the Admiralty. Three thousand men have been brought in from other centres on the North-east Coast to speed up the Admiralty's work. The lines of demarcation are not being drawn so closely in regard to other yards, and so far there has not been any particular amount of loss of work on construction, but there must, in reference to some ships which are being built for foreign owners, be some change soon. Possibly boats may change hands which are being built for unfriendly countries, and that may help to keep work going. Obviously it is too much to hope that this state of activity in commercial building will continue long.

Messrs. Readhead & Sons, South Shields, are busy on two cargo steamers for the Moor Line, Ltd., Newcastle.

Palmer's, of Jarrow and Hebburn, have just begun work on a large refrigerating steamer, 420 ft. long, for Messrs. Furness, Withy & Co., of West Hartlepool, and an oil-carrying boat for a Glasgow firm.

Messrs. Charles Rennoldson & Co., South Shields, are engaged on a coasting steamer of 340 tons carrying capacity, for Messrs. Jos. Monks & Co., Liverpool. The propelling machinery is to be installed by the Shields Engineering and Dry Dock Co.

Messrs. William Dobson & Co., Low Walker, have in hand a small cargo steamer for Newcastle owners.

Messrs. R. & W. Hawthorn, Leslie & Co., at their Hebburn yard, are busy on their latest order of four torpedo destroyers for the Turkish Government, and are making the machinery at their St. Peter's Works.

Messrs. Jos. T. Eltringham & Co., Willington Quay, have booked orders for two trawlers for French owners.

The total output in launches on the river in July was two more than in the corresponding month last year, but the total is two short for the period since the year opened.

The Wear.

(From our Own Correspondent.)

The increased naval activity on the Tyne has, to an appreciable extent, affected the work on the Wear in commercial shipbuilding. There has, however, been no slump. In July the launches on the Wear numbered seven vessels of an aggregate tonnage of 24,537 and the output for the seven months of this year is forty-four vessels of 10,000 tons greater than the forty-eight in the corresponding seven months of last year.

Messrs. Robt. Thompson & Sons, Sunderland, have received orders for two large cargo boats for Messrs. Orders and Handford, of Newport and Cardiff, and Messrs. Linvig and Co., Christiania.

The Sunderland Shipbuilding Co. has received orders for two steamers for Messrs. Watson & Co., Manchester. They are building a collier of 3,250 tons carrying capacity for Messrs. Louber Gebruder, of Hamburg, and a steamer of 6,000 tons for Messrs. A. F. Klaveness & Co., of Lysaker, Christiania. The North-Eastern Marine Engineering Co. are to supply the propelling machinery.

Messrs. Jos. Blumer & Co., Sunderland, have an order for two cargo steamers for the Moor Line, Ltd., Newcastle.

Messrs. Sir James Laing & Sons, Sunderland, have received an order for a large oil tanker for Norwegian owners.

Messrs. Doxford & Sons, Sunderland, have an order for a geared turbine steamer of 5,500 tons for the Cairn Line, Newcastle. The owners have sold the hull of the experimental ship *Vespasian* and intend to have all its machinery installed in the new boat.

Messrs. Osborne, Graham & Co. have received an order for a cargo steamer 215 ft. by 32½ ft. for Rotterdam owners.

THE TEES AND HARTLEPOOLS.

(From our Own Correspondent.)

Whitby.

Messrs. R. Harrowing & Co. have sold the s.s. *Ethelaida* of 2,669 gross tons to a British firm in Constantinople for about £9,500.

Stockton and Thornaby.

Mr. G. B. Craig, yard manager to Messrs. Craig, Taylor and Co., was recently presented with a tea and coffee service and salver by W. Young, Esq., one of the Directors of the firm, on behalf of the officials and workmen on the occasion of his forthcoming marriage.

Middlesbrough.

Since the commencement of the war, the s.s. *Emma Minlos*, 1,286 gross tons, managed by Messrs. W. Minlos & Co., Lubeck, has been seized as a prize of war.

West Hartlepool.

Messrs. Furness, Withy & Co. have sold the s.s. *Swansea Trader*, 480 gross tons to the Grangemouth Dockyard Co., and it has been resold through Messrs. J. H. Elliott & Co. to foreign owners.

Hartlepool.

The Hartlepool Port and Harbour Commissioners are about to ask for tenders for a launch 25 ft. long, 7 ft. 6 in. beam, with a speed of 9 knots, for use in connection with their various dredgers and works.

The s.s. *Denebola*, 1,481 gross tons, managed by Messrs. Holm & Molzer, Flensburg—having a cargo of pit props—has been taken as a prize of war.

Nearly all the shipbuilding and engineering works not engaged on war contracts are now working five-eighths time, and in some cases are making parts of machinery for other firms engaged on Admiralty work so as to facilitate the completion of work on hand.

No firms in the district have reported any new contracts for shipping, and in many cases work is only going on, when the vessels are urgently required.

THE HUMBER AND DISTRICT.

(From our Own Correspondent.)

Hull Dock and Riverside Quay.—During the month there has been great depression at the docks and quays owing to the war crisis. Several large steamers arrived safely and discharged their valuable cargoes of food stuffs, and the Danish butter steamers are arriving from Denmark with all classes of produce. Our Navy is performing work of great value at this critical time by keeping the sea clear of the enemy's war vessels, and thus enabling food stuffs to come into English ports. The new King George Dock has several hundreds of trawlers laid up therein, on account of the war, and many hundreds of fishermen are idle. A few trawlers got away about the middle of last month to fish in Iceland waters and the West of Scotland. The Wilson Liner R.M.S. *Aaro* has been chartered to take the Austrian Ambassador to a Mediterranean port. The fine Wilson Liner R.M.S. *Eskimo* is held up in Norway, and a number of the Wilson Line officers and R.N.R. men are serving in the Navy for their country. The s.s. *Borodino* is berthed in the Albert Dock, full of German prisoners of war. There are some among them, who have lived in Hull for years, but at the present the Government is taking great care of them. There are patrols of soldiers all over the docks and sentries at the gates. The graving docks at Alexandra Dock and King George Docks are taken over by the Government in the event of war vessels requiring them, H.M.S. *Lively* and *Violet* have been in the docks, and went under repairs, and proceeded to sea again in very quick time.

Messrs. North-East Coast Engineering Works, Ltd.—Owing to the war several vessels that were coming to this port, have been diverted to other ports. This firm is, however, preparing for the rush of work that is bound to come later. The s.s. *Diadem* and s.s. *Irina* have had the usual engine room and deck repairs. It is with deep regret we have to report that the principal of the firm has passed away, in the person of John Clarke. The business will be carried on by the two sons, Edward and John, who have had great experience under the guidance of their father; both of the sons have had sea-going experience, and have carried out several rather large and expensive repairs in graving docks and afloat.

Messrs. Cooper & Co., Ltd., engineers and ship repairers, have been kept fairly busy, but many of the ship owners will not take advantage of the vessels being laid aside, hence the repairing department is not so busy. The firm's own graving dock is kept fully employed with coasting steamers, etc.

Messrs. Woodall & Co., engineers, etc.—Repair work on vessels is scarce, but the firm are doing repair work for the Hull (Trams) Corporation, and also making forgings for the London County Council.

Messrs. Livingstone & Cooper, Ltd., shipbuilders, Hessle, have launched the third steam drifter *The Majesty* for the Yarmouth Steam Drifters Co., Ltd. she is a beautifully-finished vessel, and built greatly in excess of Lloyd's requirements. Messrs. Crabtree & Co., Ltd., of Yarmouth, will engine the vessel. The firm have now an Iceland trawler in frame, and are laying the keel of another larger vessel for Iceland trawling. The Company are in a position to build all classes of vessels up to 250 ft. and can give good delivery.

Hull Brassfounder and Coppersmith.—We regret to report that the death of Mr. Charles C. Clark, head of the firm of George Clark & Sons, Ltd., coppersmiths and brassfounders, Alexandra Works, Waterhouse Lane, Hull, took place recently at Bridlington. The business was established by the father of Mr. Clark in 1859, and is one of the biggest works in the country, and does a large business with the Government and engineering works throughout England. Mr. Clark has left three sons, all of whom are connected with the business, and take an active part therein. The funeral took place at Hull on 21st August.

SOUTH OF ENGLAND AND ISLE OF WIGHT.

(From our Own Correspondent.)

Southampton.—Bills with the following announcement have been posted on all the principal hoardings:—

> "I am commanded by the Lords Commissioners of the Admiralty to convey to all men employed in fitting, and coaling transports at Southampton their Lordships' thanks for their splendid work."

H. STANSBURY, Captain,
Divisional Transport Office.

The announcement is highly gratifying to all concerned, who during the rush were working night and day to get the various ships completed as early as possible.

Some of the dockers are in very bad straits here, as cargo work at the docks has been at a complete standstill, and liners diverted to other ports. As we go to press, however, the welcome news has been announced that the docks, closed since the outbreak of the war, would be open on the 25th August for ordinary traffic. The Transport Authorities will now probably only require one part of the dock for their operations. The local Shipping Companies are busy arrangeing their new sailing lists.

The first vessel to be sunk in the present war was the *Königin Luise* of the Hamburg-American Line, which at the time was acting as a mine layer for the German Government. Last May the ship visited Southampton, when a special party, including according to report, Mr. Churchill, went on a trial run (in the Solent) to inspect the working of the Föttinger hydraulic transformer, which was installed between the turbines and the propeller shafting. The vessel was sunk by the T.B.D. *Lance*, built at Messrs. Thornycroft's, Southampton, who made special efforts to complete the vessel so as to hand her over to the Admiralty at the earliest possible moment. Since then the sister vessel the *Lookout* has been similarly accelerated and handed over. It is to be hoped that the special efforts put forward by Messrs. Thornycroft will not be forgotten.

Several yachts well-known locally have been accepted for hospital work by the Board of Admiralty official —Lady Beatty, Lord Tredegar, Mr. Loeffler and Mr. Alfred Farquhar have placed their yachts at the Government's disposal. The largest of these yachts is Lord Tredegar's *Liberty* of 1,571 tons Thames measurement. Mr. Loeffler's *Albion* is of 1,346 tons and is propelled by triple screws driven by Parsons turbines. Mr. Farquhar's yacht *Medusa* was built by Messrs. Day, Summers & Co., of Southampton. Lady Beatty's yacht is the *Sheelah* of 679 tons. The local yachting industry has been very badly hit by the war, and what promised to be a very busy season has had a very abrupt ending. The German vessel *Hanna Larsen* of Rostock has been brought in here as a prize of war and the famous yacht *Germania* has also been seized by the local authorities.

THAMES.

(From our Own Correspondent.)

Requisitioning of British Ships.—Just prior to the outbreak of the war, rules were promulgated and a Board of Arbitration appointed by the Government, of which Lord Mersey is the President, with the view of settling any disputes that may arise between the Admiralty and shipowners when vessels are called up. Endeavours are to be made by the parties concerned to come to agreement, but failing this, recourse will be to the President who then puts the claim before two arbitrators whom he may select from a panel with instructions and their award if given shall be final, and in the alternative the President will act as umpire in the dispute and his decision will settle the matter. Mr. William Walton is appointed Vice-President, and the panel, a long list, includes Government nominees, shipowners, bankers, underwriters, marine insurance companies, insurance brokers and average adjusters. In view of the great issues at stake at the present time such a Board of Arbitration has been appointed none too soon.

The War and Ship Repairs.— The firms which do the repairing work of the country have recently had a meeting in London and have issued a notice signed by the Chairman and Secretary and addressed to the Admiralty by which they agree to unreservedly place their docks and yards at the service of the Government as may be required during the progress of the war. This is seen to be a very important matter in view of the demands that may possibly arise for the services of the trained staffs and plant in the possession of these firms.

Thames Steamboats.—It appears that the German Government made an offer for three of these boats through an intermediary, but when the Company found out who the actual buyers were they refused to proceed further with the matter. It is supposed the vessels were to be used for the conveyance of German troops, their light draught probably being an advantage for the service in which they were to be employed.

Shipping Federation.—The late Chairman, Mr. T. L. Devitt, was entertained at dinner recently on his retirement from this position and presented with oil paintings and a gold watch. Among those present were included Lord Southwark, Sir Walter Runciman, the Rt. Hon. Walter Long, Sir Arthur Holland and Sir W. S. Watt , the chairman, who presided.

Seagoing Education.—In these days no effort is spared to promote the training of youths for sea service and we note the prize day on the *Worcester*, at which Capt. Sir Acton and Lady Blake received the guests and Admiral Sir E. R. Fremantle presided, Sir Thos. Sutherland, the chairman of the training college being unavoidably prevented from attending. A very satisfactory report was presented of the boys at the distribution of prizes which followed. In this connection we notice that Devitt and Moore's cadet training ship was lately at Immingham, not being able to get to the Thames owing to the outbreak of the war. The other vessel engaged in this work is on her way home from Sydney, and is due here in November.

MERSEY AND MANCHESTER SHIP CANAL.

(From our Own Correspondent.)

ALONG with other ports, Liverpool has been playing not a small part in the general activities in connection with the war which has been taken up with such splendid spirit and determination. As is the case with many other ports, part Martial Law prevails. Shipowners have been requested to move vessels in and out of port in daylight, whilst those inward bound have to marshal themselves for inspection before proceeding up the harbour. Soon after these regulations came into force, the s.s. *Mongolian* attempted to proceed, not understanding the signals. A blank shot was fired, and later a shot was put through her bows, which, whilst not attended with any fatal or other injuries to the crew, was the means of at once causing the anchor to be dropped. The Prince's landing stage has been boarded off at intervals, for the use of the Government transports, the large Harbour Board floating cranes having been much in evidence.

Due to the pressure at Southampton, the *St. Louis* and other steamers have been seen in the Mersey, whilst many well-known liners have been seen in strange guises to ensure their safety. The one outstanding feature prevailing has been one of serious determined calm.

Messrs. Cammell, Laird & Co., Ltd.—The usual holiday period at these works, *viz.*, the August Bank Holiday week, saw the firm busier than ever, the men having been requested to return to work on August 4th. Needless to say, great activity prevails upon Admiralty work, and the firm throughout its staff and employés are nobly assisting in the maintenance of Britain's naval supremacy. A smart repair contract was recently executed by the firm, when the *King Orry* was dry docked after taking the ground off Ramsey, Isle of Man, this vessel being back on the service a week after grounding.

The Mersey Docks and Harbour Board.—In view of the present national emergency, the dispute between the Board and its employés has been mutually settled in the meantime. The points at issue may be brought up later.

Messrs. John Glynn & Son.—This firm of shipowners have issued the following notice to shippers to Italian and Sicilian ports :—" We respectfully inform you that from August 5th, and until further notice, all our advertised sailings have been withdrawn.

The Birkenhead Ferries.—Captain W. E. Langshaw, late assistant superintendent of the Newport (South Wales) Docks and Railway Co., has been appointed to the position of manager of the Birkenhead Ferries, at a salary of £500, rising to £600. Captain Langshaw has also seen service with the Manchester Ship Canal, and holds a master's and extra master's certificate.

Admiral Sir John Jellicoe.—It is of interest at the present moment to note that both the gallant Admiral and Rear-Admiral Madden, chief of the staff to Admiral Jellicoe, each married a daughter of Sir Charles Cayzer, the well-known shipowner.

The Late Mr. Matthew Clover.—Mr. Matthew Clover, late of Rose Lea, Willaston, Cheshire, and joint managing director of Messrs, Clover, Clayton & Co., left estate of the gross value of £112,254 14s. 6d.

The Wallasey Corporation have proposed to increase their fleet of ferry steamers by the addition of three new steamers, *viz.*, two for passenger and one for luggage use.

NORTH-WEST OF ENGLAND.

(From our Own Correspondent.)

Barrow-in-Furness.—The war introduced a vigorous state of activity in all departments of war at Messrs. Vickers, which has hitherto been unknown. The fact that the battleships *Reshadieh* and the *Emperor of India* have been nearly completed has made it necessary to bring into life a still greater amount of push than was the case before the war was brought about. The *Reshadieh*, built for the Ottoman Government has been taken over by the British Government, much to the chagrin of the Turks, who particularly wanted early delivery of this vessel. She is now known by the name of H.M.S. *Erin*, and is to be ready for delivery to the Admiralty on the 24th of August. A very big staff of men are employed on this vessel, and the number has been substantially increased by the engagement by the firm of many hundreds of skilled workmen, induced to come to Barrow from other shipyards in the country at which mercantile tonnage only is conducted. To some extent the transfer has been made on lines of patriotism, and a desire to help forward the best interests of the country at a crisis like the present. The *Emperor of India* is also being pushed forward towards completion with the greatest possible rapidity. It was expected she would be ready to deliver to the Admiralty by the end of the year,but the present speeding up looks as though she would be ready before that time. The

Erin carries ten 13·5-in. guns and the *Emperor of India* will be mounted with 15-inch guns. These two vessels will be a great assistance to the Navy in the work it has now before it, and every effort will be made to complete the vessels and make them effective units of the British Navy at as early a date as possible. Vickers' yard is guarded by a considerable number of Territorials, and the docks are also being guarded by a strong force of men, and so also is Roa Island at the entrance to the harbour of Barrow. A strong force is also to be found on Walney Island, where there is a garrison company of artillery, and guns are now fixed and trained ready to bring down any foreign aircraft which may make its way into this district. The declaration of war has naturally brought with it many orders for the firm for gun mountings, shells, projectiles and other classes of Admiralty requirements. The men in all departments are working overtime, and the Trade Unions in a spirit of patriotism have given notice withdrawing their restrictions as to the amount of overtime allowed to be worked by the men. Speeding up is also the rule with the light cruisers *Penelope* and *Phaeton* building in Messrs. Vickers' yard, together with the oil-carrying oil driven tank steamer *Olympia*, which is expected to be ready at the end of this year. The submarine department is also busy to an unwonted extent. Progress is being made with the Brazilian extension to the Rio dock. Orders are plentiful in all branches of the shipbuilding business.

LAUNCHES AND TRIAL TRIPS.

THE TYNE AND WEAR.

Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle-on-Tyne.

BJORGVIN. Launch, August 8th. Norwegian coast defence battleship launched from the Elswick yard. The *Bjorgvin* is a sister vessel to the *Nidaros*, launched from the same yard on 9th June. These vessels have a length of 310 feet, and are each of 4,875 tons displacement. Their principal armament consists of two 9·45-inch guns and four 6-inch guns. The whole of the armament is being constructed at Elswick, and the whole of the armour is being manufactured at the firm's Openshaw works at Manchester. The propelling machinery and boilers for both vessels are being constructed by Messrs. Hawthorn, Leslie & Co., St. Peter's Works.

John Crown & Son, Ltd., Sunderland.

TORQUAY. Launch. Steel screw steamer built to the order of Messrs. Renwick, Wilton & Co., Limited, of Dartmouth and Torquay, for their coasting trade. The vessel is designed with self-trimming hatches to carry a deadweight of 1,100 tons on a light draught of water and is constructed with clear holds and has a full equipment of deck machinery for the rapid discharging of cargo. The propelling machinery and boilers will be supplied and fitted by Messrs. The North Eastern Marine Engineering Co., Limited, of Sunderland.

William Doxford & Sons, Ltd., Sunderland.

BLAND HALL. Launch, August 8th. Shelter-deck vessel built to the order of Messrs. Edward Nicholl & Co., Cardiff. The length of the vessel is 402 ft., breadth 52 ft., depth moulded 26 ft. 9 in. and the deadweight capacity is 8,200 tons. Classification is with the Bureau Veritas.

Osbovrne, Graham & Co., Sunderland.

PENSACOLA. Trial Trip, July 23rd. On the trial everything was very satisfactory, the mean sea speed of 9½ knots with a loaded vessel being easily obtained. After the trial the vessel proceeded on her voyage to Lisbon under the command of Captain White. For Launch, see July issue.

Wm. Pickersgill & Sons, Ltd., Sunderland.

BEEMAH. Launch, August 10th. Steel screw steamer of the following dimensions :—Length 395 ft., breadth 51 ft. 9 in., depth 29 ft. 6 in. The vessel has been built under special survey to take Lloyd's highest class as a single-deck steamer. She is constructed on the deep frame system, and is fitted with cellular double bottom throughout for water ballast, in addition to which the after and fore peaks are fitted as a ballast tank. The vessel is provided with five large cargo hatches, each of which is fitted with double derricks with tables and outriggers capable of raising heavy weights, large derrick posts being fitted where necessary. The ventilation of all cargo holds has been specially attended to, four large ventilators being fitted to each hold. The vessel will be rigged as a fore and aft schooner, with steel lowermasts and wood telescopic topmasts. The machinery and boilers are being supplied and fitted by Messrs. Richardsons, Westgarth and Co., Ltd., the engines having cylinders 25½ in. by 42 in. by 70 in. by 48 in. stroke, and the three large boilers are of steel, with a working pressure of 100 lbs. The vessel has been built to the order of Messrs. Rowland & Marwood's Steamship Co., Ltd., of Whitby. Messrs. Wailes, Dove & Co.'s "Bitumastic" enamels have been applied throughout the engine and boiler room tanks, bunkers, etc. and their "Bitumastic" covering to the tank tops.

Palmers' Shipbuilding and Iron Co., Jarrow-on-Tyne.

MURRAY. Launch, August 6th. Torpedo-boat destroyer and the first of two torpedo-boat destroyers building to the order of the British Government; the sister ship *Myngs* is on the stocks in an advanced state of construction. The *Murray*, which is the 839th ship launched by Palmers' is the thirty-first destroyer the Company have built since 1895, when they commenced by designing and building three of the earliest 27-knot vessels. There followed thirteen vessels of 30 knots speed, and subsequently a number of ships of a greatly increased displacement and having a speed of 25½ knots. Later the Company completed the large destroyer *Viking*, which attained a speed of 33 knots. It is fifty-eight years since Palmers' launched their first warship, the armour-plated *Terror*. Since then they have launched over eighty ships of war for his Majesty's Government, including the battle cruiser *Queen Mary*, the Dreadnought battleship *Hercules*, the *Lord Nelson*, and other smaller craft.

John Readhead & Sons, Ltd., South Shields.

TREMATON. Launch, July 23rd. Steel screw steamer built to the order of Messrs. Edward Hain & Son, St. Ives, Cornwall, and named the *Trematon*. The dimensions of the vessel are 382 ft. by 51 ft. 6 in. by 26 ft. 8½ in. She will carry a deadweight cargo of over 7,800 tons on a light draught of water. She is of the complete shelter-deck type to Lloyd's highest class and under their special survey, and has large clear holds fitted with shifting boards, etc., for grain cargoes, with a full equipment of steam winches and derricks for rapid handling of cargo. The vessel will be fitted with triple-expansion engines, also constructed by Messrs. John Readhead and Sons, Ltd., having cylinders 26 in., 42 in., 69 in., with 48 in. stroke, supplied with steam from two large steel boilers working at a pressure of 180 lbs. per square inch.

Sunderland Shipbuilding Co., Sunderland.

PACIFIC. Launch, July 27th. Cargo steamer built to the order of Messrs. W. H. Cockerline & Co., Hull. Principal dimensions are :—Length 385 ft., breadth 53 ft. 6 in., depth moulded, 27 ft. She is of the single-deck type, with poop, long bridge and forecastle, and will take Lloyd's highest class under special survey. Shifting boards are fitted throughout, and all the requirements of the Grain Act are being complied with, in order that the Board of Trade certificate may be obtained. The main engines are by Messrs. Blair & Co., Ltd., of Stockton, and have cylinders 25 in., 42 in. and 68 in. by 48 in. stroke, steam being supplied by two large boilers working at a pressure of 180 lbs. per square inch.

Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.

MORVADA. Launch. Twin-screw passenger steamer built to the order of the British India Steam Navigation Company, London, for service to India. Messrs. Swan, Hunter & Wigham Richardson, together with Messrs. Barclay, Curle & Co., Whiteinch, have in hand a number of important vessels for these owners, and the *Morvada* is the twenty-second launched by the two companies in recent years for the same owners. The chief dimensions of the vessel are 464 ft. in length over all, 58 ft. in breadth, with a moulded depth of 36 ft. Messrs. Wailes, Dove & Co.'s Patent "Bitumastic" enamels have been applied throughout the bunkers and tanks, and their Patent "Bitumastic" covering to the tank tops.

Swan, Hunter & Wigham Richardson, Ltd., Newcastle-on-Tyne.

VARSOVA. Trial Trip. There has been despatched from the Tyne the passenger steamer *Varsova*, which has been built to the order of the British India Steam Navigation Co., Ltd., of London. The steamer is 390 feet in length, and is propelled by twin-screw triple-expansion engines. On her trial trip she attained a speed of over 16 knots per hour. For Launch, see July issue.

Robert Thompson & Sons, Ltd., Sunderland.

RECINA. Launch, July 23rd. Cargo steamer for Fiume. Principal dimensions are:—Length overall 396 ft. 9 in., breadth extreme 52 ft., and depth moulded 26 ft. 6 in. She takes the highest class at Lloyd's and is of the single-deck type, with a full poop, cargo bridge amidships 240 ft. long, and topgallant forecastle where the crew will be comfortably berthed. She is fitted up with a full set of shifting boards and grain feeders, the vessel being placed on the Board of Trade list of exempted vessels for the grain trade. Ample water ballast is provided in the cellular bottom and the after-peak tank. The cargo holds, clear of all obstructions, are divided by a centre longitudinal steel bulkhead, with five cargo hatchways, having double derricks fitted on tables with crosstrees at mastheads, also double derrick posts to poop and bridge hatches, all arranged for rapid loading and discharging and worked by ten powerful steam winches, two being placed at each large hatch, with the exhaust steam passing through a winch condenser. A large multitubular donkey boiler of ample capacity, placed in the casing on deck, will supply steam to the deck machinery. Powerful steam windlass, steering gear, etc. are fitted, the vessel being thoroughly up-to-date with a full and complete specification. The engines, by Messrs. The North Eastern Marine Engineering Co., Ltd., Sunderland, have cylinders 25 in., 41 in. and 68 in. with a stroke of 45 in., steam being supplied by large boilers working at a pressure of 180 lbs. per square inch, being fully equipped with evaporator and feed heater, feed filters, etc.

The Tyne Iron Shipbuilding Co., Ltd., Willington-Quay-on-Tyne.

GARDENIA. Trial Trip, July 15th. Throughout the trial run the machinery worked well and gave satisfaction to all concerned. Amongst those present on the trial were Mr. Johnson Robinson, representing the owners, Mr. G. Milne, under whose supervision the vessel has been constructed, Mr. J. Bourn, representing the shipbuilders, and Mr. D. Myles and Mr. J. Daglish, representing the engine-builders. For Launch, see July issue.

ELBRUZ. Trial Trip, July 16th. On the above date a most interesting trial trip took place off the Coast of Holland. It was that of the first motor-driven tank oil vessel to be built on the Tyne. The vessel, which was named the *Elbruz*, has been built for the Société Anonyme d'Armement d'Industrie et de Commerce, of Antwerp, and is of the following dimensions:—390 ft. in length by 51½ ft. beam by 29 ft. moulded depth and she carries a total deadweight of nearly 7,000 tons. She is fitted with twin screws and has been built under the superintendence of Capt. J. C. F. Muller on behalf of the owners. The interesting feature is that she is driven by twin screw motors; each of the internal combustion engines having six cylinders 560 mm. diameter by 1,000 mm. length of stroke. The machinery has been constructed by Messrs. The Nederlandsche Fabriek Von Werktuigen on Spoorweg Materieal, of Amsterdam, otherwise known as the Werkspoor Works and on the trial, which was loaded and of twelve hours' duration, everything worked most smoothly and without a hitch of any kind, and a mean speed of 11½ knots was attained, being half a knot in excess of the contract speed.

THE TEES AND HARTLEPOOLS.

Craig, Taylor & Co., Stockton-on-Tees.

VALDES. Launch, August 6th. Shelter deck screw steamer built to the order of Messrs. Robert MacAndrew and Co., London. Dimensions:—277 ft. by 40 ft. by 26 ft. 11 in. moulded to shelter deck, built to the highest class in Lloyd's registry, under special survey. Water ballast is provided for in double bottom fore and aft and in peaks. She is equipped with patent steam windlass with quick-warping ends, steam-steering gear, six steam winches, electric light, winch condenser, telescopic masts, special derrick for lifting 25 tons, and all the latest improvements for rapid loading and discharging. Her engines have been constructed by The North Eastern Marine Engineering Co., Ltd., Sunderland, the cylinders being 21 in., 34 in. and 56 in. by 39 in. stroke, with two large single-ended boilers working at 180 lbs. pressure. The vessel has been specially built for the Spanish fruit trade, and is fitted with special ventilating arrangements for this trade.

Sir Raylton Dixon & Co., Ltd., Middlesbrough.

SYRIA. Launch, August 10th. Steel screw passenger and cargo steamer building to the order of the National Steam Navigation Co., Ltd., of Greece. The vessel is being constructed under special survey to receive the highest class at British Corporation and to comply with British Board of Trade requirements for passengers. She is of the awning deck type with bridge and forecastle, her leading dimensions being 274 ft. by 40 ft. by 22 ft. 6 in. moulded and she will have luxurious accommodation for about one hundred first-class, ninety second-class and about two hundred third-class passengers. There will be a complete installation of electric light and bells, steam heating, etc. For the purposes of communication there will be a Marconi wireless installation, and the vessel will have ten lifeboats and five water-tight steel bulkheads, etc. The steam steering gear will be of the Wilson-Pirrie type worked by telemotor and the outfit will include a Cochran (Annan) donkey boiler, fitted with patent seamless furnace, five steam winches, steam windlass, eight derricks, etc., and all latest appliances for expeditiously dealing with cargo. Triple-expansion engines, having cylinders 23½ in., 38 in. and 62 in. by 39 in. stroke with two large single-ended boilers working at 180 lbs., pressure will be fitted by Messrs. George Clark, Ltd. Sunderland.

TAHCHEE. Launch, July 23rd. Steel screw steamer constructed to the order of the Tank Storage and Carriage Co., Ltd., of London, to fulfil the owners' requirements for their extensive oil-carrying trade. The vessel is being built on the Isherwood logitudinal framing system to class A1 at Lloyd's, and is of the two-deck type, with poop, bridge and forecastle. Her principal dimensions are 434 ft. by 54 ft. 6 in. by 32 ft. 8½ in. moulded and she will have a carrying capacity of about 9,250 tons on a light draught of water. The vessel has ten holds, divided by centre bulkhead, making twenty tanks, for the carriage of oil in bulk, and cargo hold forward. She will also have ten summer tanks in the 'tween decks at each side for the carriage of light oil. Oil bunkers will be carried in a deep tank forward and in cross bunker, giving a total capacity for oil of about three million gallons. Water ballast will be carried in cellular double bottom under engines and boilers and in fore and aft peaks. Insulated chambers will be provided for the ship's provisions and the steamer will have a very complete installation of electric light, while in the pump room amidships will be fitted a large pumping installation, consisting of powerful duplex oil pumps, each capable of dealing with 300 tons per hour. For the purpose of communication, a wireless installation on the Telefunken principle will be fitted, and also the Willett-Bruce system of electric whistle control. Quadruple-expansion engines, placed aft, having cylinders 24 in., 35 in., 50½ in. and 73 in. by 51 in. stroke, supplied with steam by three large single-ended boilers working at 220 lbs. pressure under Howden's system of forced draught, will be fitted by the North Eastern Marine Engineering Co., Ltd., Wallsend-on-Tyne. Oil-fuel burning apparatus by the Wallsend Slipway and Engineering Co., Ltd., is fitted to the boilers.

Wm. Gray & Co., Ltd., West Hartlepool.

PRIKONISOS. Launch, July 24th. Steel screw steamer built for Messrs. Pandeli Brothers, Constantinople, to the highest class in Lloyd's register, and of the following dimensions:—Length overall 362 ft.; breadth 50 ft., and depth 25 ft. 0½ in. with extra long bridge, poop and topgallant forecastle. The saloon, state-rooms, captain's, officers' and engineers' rooms, etc., will be fitted up in houses on the bridge deck and the crew's berths in the forecastle, and an electric light installation is fitted throughout. The hull is built with deep frames, cellular double bottom and large aft and fore-peak ballast tanks, eight steam winches, twelve derricks, derrick tables and outriggers, steam-steering gear amidships, hand screw gear aft, patent direct steam windlass, large horizontal multitubular donkey boiler, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, boats on deck overhead, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of the builders, having cylinders 25 in., 40½ in. and 67 in. diameter, with a stroke of 45 in. and two large steel boilers adapted for 180 lbs. working pressure per square inch. The engine room auxiliaries include a winch condenser, evaporator, feed and ballast pumps of the "CMEW" type.

SKJOLDBORG. Trial Trip, July 31st. The performance of ship and machinery on trial trip was satisfactory in all respects. For Launch, see August issue.

W. Harkess & Son, Ltd., Middlesbrough.

FALERNIAN. Trial Trip, July 16th. The ship and engines gave entire satisfaction, the average speed obtained being 11½ knots. For Launch, see July issue.

PATROL. Trial Trip. The official trials proved entirely satisfactory, a speed of 11½ knots being maintained. For Launch, see June issue.

Irvine's Shipbuilding & Dry Docks Co., Ltd., West Hartlepool.

SANTERAMO. Trial Trip, July 29th. Throughout the trial in Hartlepool Bay the engines and all auxiliaries worked admirably, a speed of 12 knots being attained. The vessel afterwards proceeded on her voyage to Montreal. For Launch, see August issue.

HAMBLETON RANGE. Trial Trip, July 31st. The official trial trip took place in Hartlepool Bay, and throughout the trial the engines and all auxiliaries worked very satisfactorily, a speed of 12 knots being attained. The vessel afterwards proceeded on her voyage to Fowey. For Launch, see August issue.

BRISBANE RIVER. Launch, August 21st. Steel screw steamer, built to the order of Messrs. Furness, Withy & Co., Ltd., for the British Empire Steam Navigation Co., Ltd., London. The dimensions of the vessel are 412 ft. by 52 ft. by 30 ft. depth moulded, carrying over 8,000 tons on a moderate draught. She is built to Lloyd's highest class, having complete main and upper decks of steel with poop, bridge and forecastle, and water ballast is carried in cellular double bottom and fore and after peaks. The vessel is constructed on the deep frame principle, giving exceptionally clear holds for the stowage of bulky cargoes, and is divided into seven watertight compartments by six transverse bulkheads. Wood grain divisions are fitted throughout the holds according to the latest Board of Trade regulations, four large hatches are provided, together with a cross bunker hatch, and the vessel is replete with all the latest facilities for the rapid loading and discharging of cargo, including ten steam winches and ten derricks. A powerful quickwarping steam windlass is fitted forward, and combined steam and hand steering gear on the Wilson & Pirrie principle is fitted in a house aft with telemotor connection to the bridge. A large ice house is also fitted for the crew's provisions, etc. The machinery, which has been constructed by Messrs. Richardsons' Westgarth & Co., Ltd., Hartlepool, consists of a set of "Richardson's" standard triple-expansion engines, having cylinders 26 in., 42 in. and 70 in. by 48 in., with three large boilers 180 lbs. pressure. The condenser is of the contraflo type, and the engine room auxiliaries include a contraflo winch condenser, cascade filter, Morison's evaporator, etc.

Richardson, Duck & Co., Ltd., Stockton-on-Tees.

RHYDWEN. Launch, July 28th. Steel screw steamer of the following dimensions:—Length overall, 394 ft.; breadth extreme, 51 ft.; depth moulded, 30 ft. 4 in.; gross tonnage about 4,800 tons. This vessel, which has been built to the order of the W. & C. T. Jones Steamship Company Limited, of Cardiff, will class 100 A1 in Lloyd's register and has been built under special survey. She is of the single-deck type and has cargo poop, bridge amidships and topgallant forecastle for crew, accommodation for captain, officers and engineers being fitted up in steel houses on bridge deck. A cellular double bottom throughout and peak tanks are fitted for water ballast, and equipment includes seven steam winches, winch condenser for dealing with exhaust steam with separate circulating donkey, horizontal multitubular donkey boiler, steam windlass with quick-warping ends, fourteen derricks, stockless anchors, steam-steering gear, etc. The engines by Messrs. Blair & Co., Ltd., have cylinders 26 in., 42 in. and 70 in. with a stroke of 48 in., steam being supplied by three single-ended boilers having a working pressure of 180 lbs.

Ropner & Sons, Ltd., Stockton-on-Tees.

STEAMER. Launch, August 21st. Steel screw steamer of the following dimensions, viz.:—Length 398 ft. 3 in., breadth extreme 53 ft. 6 in., depth moulded 36 ft. to shelter deck. The vessel is built to the highest class at Lloyd's, having upper and shelter decks. The vessel has a direct steam quick warping windlass, stockless anchors, steam steering gear amidships, with powerful screw gear aft, and is fitted with ten large steam winches, all working at 100 lbs. steam pressure, double derricks to each hatch, and all her appliances for loading and discharging cargoes expeditiously are very complete. Triple-expansion engines will be supplied by Messrs. Blair & Co., Ltd., of Stockton-on-Tees, having cylinders 25 in., 42 in., 68 in. by 48 in. stroke, steam being supplied by three single ended boilers, each 14 ft. 3 in. by 11 ft., with a working pressure of 180 lbs., and fitted with evaporator, etc.

THE HUMBER.

Cochrane & Son, Selby.

SEA SEARCHER and SEA RANGER. Launches, July 25th. Steel screw trawlers, the principal dimensions being 125 ft. by 22 ft. 6 in. by 13 ft. moulded. The vessels have been built to the order of Messrs. The Humber Steam Trawling Co., Ltd., Hull, and will be fitted with powerful triple-expansion engines by Messrs. Amos & Smith, Ltd., Hull.

NORTH-WEST OF ENGLAND.

Cammell, Laird & Co., Ltd., Birkenhead.

CUIDAD DE MONTE VIDEO. Launch, July 25th. Twin-screw steamer, the second of two vessels building by them for the Argentine Navigation Company (Nicolas Mihanovich), Ltd. The length over all is 364 feet, and the speed will be 18 knots. Accommodation will be provided for 500 first-class and 275 second-class passengers. The propelling machinery consists of two sets of Parsons patent geared turbines. This will be the first geared turbine steamer built for South American waters. Messrs. Wailes, Dove & Co.'s Patent "Bitumastic" Enamels have been applied throughout the engine space, holds, boiler rooms, ballast tanks, coal bunkers, etc.

DEVON. Trial Trip, July 30th. The Royal Mail Steam Packet Company's steamer *Devon* has successfully completed her official speed trials. The vessel is specially designed for the service of conveying chilled and frozen meat from the reaches on the upper reaches of the river to the ocean-going steamers engaged in the chilled meat trade and is an important acquisition to the Royal Mail Company's Fleet. For Launch, see July issue.

CANADIAN CAR FERRY. Trial Trip, July 28th. The official speed trials of the Canadian car ferry and ice-breaking steamer built for the Transcontinental Railway Company of Canada were successfully completed off the Mersey. This vessel is intended for service on the River St. Lawrence between Quebec and Levis, and is a highly interesting specimen of naval architecture. Her principal dimensions are length 326 ft., beam 65 ft., with a draught of about 15 ft. For Launch, see February issue.

SOUTH OF ENGLAND.

Phillip & Son, Ltd., Dartmouth.

LUKANANI. Trial Trip, August 6th. This twin-screw passenger steamer, which has been built to the order of the Crown Agents for the Colonies, was successfully tried at sea on this date when she fully attained her contract speed. For Launch, see August issue.

PIRAI. Launch, August 8th. Twin-screw passenger steamer, building to the order of the Crown agents for the Colonies, for passenger ferry service in British Guiana. The vessel is one of six similar vessels and is a sister ship to the *Haimara*. See July issue (South of England Launches.)

John I. Thornycroft & Co., Ltd., Southampton.

QUERANDI. Launch, July 8th. Twin-screw ocean-going tug. The vessel is a sister ship to the *Ona*, which was launched on May 28th from Messrs. Thornycroft's yard, and is of a very powerful type, having the following dimensions:—Length between perpendiculars, 130 ft.; breadth moulded, 28 ft.; depth, 18 ft. 11 in.; draught, 12 ft. 6 in. They have been built under Lloyd's survey, and are to Lloyd's highest class for towing purposes. An important part of their service will be the towage of battleships of the Argentine Navy. Two sets of triple-expansion surface-condensing engines are fitted, giving a total of 1,200 i.h.p. at 180 revolutions. The cylinders are 13½ in., 22 in. and 35 in. with a stroke of 27 in. Steam is supplied by two Scotch single-ended boilers working under natural draught, 13 ft. 6 in. diameter by 11 ft. long. Working pressure 180 lbs. A top gallant forecastle is fitted, continuing to the bridge deck. There is a large crew space forward for sixteen men, with two cabins placed at the after end for the engineers. Two cabins for officers are arranged abaft the engine room. The space right aft is fitted up as a pump room, a semi-portable salvage pump of 10 in. diameter being fitted with the necessary hose. A dining saloon for officers is arranged under the bridge deck. Galley is placed at the after end of the boiler casing. The wheelhouse and captain's cabin are placed on the bridge deck with a flying bridge over. Steering is effected by means of hand and steam gear placed in the wheelhouse, controlled from the flying bridge. A steam and hand windlass is fitted on the upper deck under the forecastle head, with a capstan head arranged over for warping purposes. A steam winch is fitted forward with a derrick on the fore mast to deal with lifts of three tons. Electric lighting is fitted throughout, power being supplied by a steam generator installed in the engine room. A search-light projector is fitted on a platform on the fore mast. Bunker capacity has been provided for about 100 tons of coal, giving a cruising range of about 1,500 miles. Two steam tugs of about the same displacement were recently built by Messrs. Thornycroft for the British Admiralty.

METEOR. Launch, July 24th. This vessel is one of two ocean-going torpedo boat destroyers under construction by the firm for the 1913-14 naval programme. They are of special design and show an advance in armament and speed over the ships of this type previously built, a speed of 35 knots being anticipated. The leading dimensions are approximately :—Length 275 ft., and breadth 27 ft. 6 in., the form of hull being of the type characteristic of the destroyers of Messrs. Thornycroft's design, which has given such satisfactory performances on the earlier vessels. The propelling machinery consists of two sets of Parsons turbines, steam being provided by four large watertube boilers burning oil fuel. The accommodation for the crew is on a liberal scale, several new features being introduced to add to their comfort. It is expected that the sister vessel, H. M. S. *Mastiff*, will be launched in about a month's time, which will leave the shipbuilding berths for Admiralty work almost vacant.

SCOTLAND.

The Ailsa Shipbuilding Company, Troon.

REEVEN. Launch, August 11th. Screw steamer for the General Steam Navigation Company. She is 250 ft. in length between perpendiculars, 37 ft. in breadth, 25 ft. in depth and is of the shelter-deck type. The Ailsa Company are building a similar vessel for the same owners. Machinery designed to give a speed of 12 knots will be supplied by the builders. Messrs. Wailes, Dove & Co.'s "Bitumastic" Enamels have been applied throughout the boiler room, bunkers, etc.

George Brown & Co., Greenock.

AUSTARITZ. Launch. Screw steamer built for the coal trade of Messrs. Plisson & Co., Paris. She is 235 ft. in length, 33 ft. in breadth and 15 ft. 9 in. in depth. The vessel is self-trimming, and has been fitted with specially large hatches. Messrs. Ross & Duncan, Glasgow, will supply the machinery. Messrs. Wailes, Dove & Co.'s patent "Bitumastic" enamels were applied throughout the engine room tank and boiler room, and their patent "Bitumastic" covering to the tank tops.

Napier & Miller, Ltd., Old Kilpatrick.

CLAN CAMPBELL. Launch, August 6th. Steel screw steamer built to the order of The Clan Line Ltd. (Messrs. Cayzer, Irvine & Co., managers). The vessel has been constructed to the highest class at the British Corporation (special survey), with 10 ft. 'tween decks, and her principal dimensions are :—Length b.p. 430 ft. ; breadth moulded, 54 ft. ; depth, 32 ft. ; with a gross tonnage of about 6,000 tons and carrying capacity of 8,600 tons. She has complete upper and main decks, with poop, long bridge and topgallant forecastle, cruiser stern giving very roomy accommodation for crew in poop, water ballast in double bottom, deep tank and fore and aft peaks. The vessel has a most complete and convenient arrangement of hatches, steel derricks (including one for 30 tons, and one for 15 tons) and eleven steam winches for the rapid handling of cargo, electric light, steam steering gear with telemotor control ; steam heating throughout accommodation ; wireless telegraphy ; Welin davits. The machinery, which is being supplied by Messrs. Dunsmuir and Jackson, Ltd., Govan, consists of triple-expansion engines with cylinders, 27½ in., 45½ in., 75 in. by 54 in. stroke, and three single-ended boilers of large size.

Stevenson & Asher, Banff.

MAGGIE COWE. Trial Trip. Steam drifter engined by Messrs. Menzies & Co., Leith, completed official trials in the Firth of Forth and afterwards proceeded to Eyemouth to fit out for the fishing. The run down the Firth was in every way satisfactory, a speed of 11½ miles being obtained. The vessel is owned by Messrs. Windram Bros., Eyemouth.

John Duthie Torry Shipbuilding Co., Aberdeen.

LOTOS. Launch, August 20th. A steam trawler, built for the National Steam Fishing Company. The vessel, which was named *Lotos*, is 115 ft. in length, 22 ft. 6 in. in breadth, and 13 ft. in moulded depth. Engines and boilers will be supplied by Mr. W. V. V. Ledgerwood, Coatbridge.

IRELAND.

Workman, Clark & Co., Belfast.

CITY OF NAGPUR. Trial Trip, August 1st. This steamer, built for the Hall Line Fleet of the Ellerman Lines, Limited, left Belfast and proceeded to Carrick Roads, where machinery tests and speed trials were carried out with most satisfactory results. The vessel afterwards proceeded to Liverpool to load cargo and receive passengers for the initial voyage. For Launch, see July issue.

The North of Ireland Shipbuilding Co., Ltd., Londonderry.

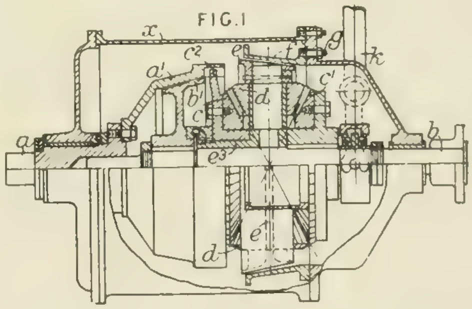
BEDALE. Trial Trip, August 15th. This steamship, which has been built on the arch principle of construction for Messrs. Furness, Withy & Co., Ltd., West Hartlepool, left to undergo her trials in Lough Foyle, when a speed of 10 knots was obtained. The trial was attended with great success, and gave general satisfaction to all concerned. A Cochran (Annan) Donkey Boiler, fitted with Patent Seamless Furnace, has been supplied. For launch see August issue.

Abridgments of New Patents.

Compiled by Messrs. E. P. Alexander & Son, Chartered Patent Agents, 306, High Holborn, London, W.C.

9248. Reversing-gearing. Reversing-gearing, suitable for marine propulsion, comprises planetary gears d, which are carried in apertures in a member e, which is integral with a central bearing e^3 on a driven shaft b, and extends outwards in the form of a web to a peripheral engaging-surface. The shaft b, which is in line with a driving-shaft a, is moved longitudinally to effect reversal by a hand-lever k. The gears d mesh with a gear c^1 fast upon the shaft b, and with a gear c loose thereon and connected by a sliding coupling c^2 with the shaft a. When the shaft b is thrust to the left, a clutch member b^1 on it comes into engagement with a member a^1 on the shaft a. The gearing then turns solid. When the shaft b is slid to the right, the periphery of the member e comes into engagement with a brake member f secured to a fixed casing x. The shaft a then drives the gear c and the

FIG. 1



gear c^1 and shaft b are driven reversely. Radial adjustment of the member f may be effected by having holes through which bolts g are passed made relatively large. Axial adjustment is effected by the use of packing-pieces on the bolts g. The member f may be supported alternatively by set-screws extending radially through axial or helical slots in the casing x.

9670. Water-tube Boilers. In boilers of the marine type, the inner and outer walls, 8, $8a$ are formed by arranging the water-tubes close together. An opening 10 at the rear of the wall 8 allows the furnace gases to pass first among water-tubes 3 and thence among the super-heater tubes 7 and finally among the remainder of the water-tubes 3 and through an opening in the wall $8a$ to the smoke-box 5. The superheater coils are arranged in vertical planes and open into horizontal headers 6. Walls of water-tubes 11 may alternate with the superheater tubes. The division of the banks of water-tubes by the insertion of the superheater in a lateral recess allows a special downcomer to be dispensed with. The waste furnace gases are used to heat an air-heater 9.

FIG. 1.

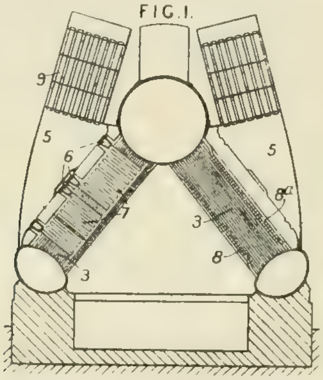
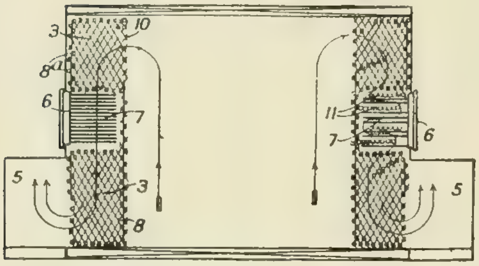


FIG. 2.



STATE INSURANCE OF VESSELS.

THE Board of Trade have arranged with an association representing the owners of steam fishing vessels a scheme of State Insurance, which will, it is hoped, enable such vessels to pursue their occupation and maintain the supply of fish for the consumption of the population. The arrangement provides that, in return for a small premium, the King's enemy risks to the vessels will be covered for a period of three months, the risks being shared between the State and the Association in the proportion of 80 to 20 per cent. Generally speaking, the scheme is based upon that already in force in regard to merchant steamships with the necessary adaptations to meet the circumstances of the fishing industry. Steam liners and drifters will be covered as well as trawlers, provided they are insured in the Association. The Committee appointed by the President of the Board of Trade on the outbreak of the war to carry into operation the Government scheme for the insurance of cargoes against King's Enemy war risks, and to advise the Board of Trade upon questions relating thereto, consists of the following members :—Mr. Douglas Owen (chairman). Sir Edward Beauchamp, Bart., M.P., Sir Raymond Beck, Sir Mackenzie Chalmers, K.C.B., C.S.I., Sir Algernon Firth, Bart., Mr. W. E. Hargreaves, Mr. E. G. Harman, C.B., Mr. H. T. Hines, Lord Inchcape, G.C.M.G., K.C.S.I., K.C.I.E., Sir Henry J. Johnson, Mr. R. B. Lemon, Mr. Arthur Lindley, Sir John Luscombe, Mr. R. A. Ogilvie, Mr. W. Richards, Rear-Admiral Sir E. Slade, K.C.I.E., K.C.V.O., Mr. J. H. Warrack, Mr. J. A. Webster. The secretary of the Committee is Mr. Walter Carter, of the Board of Trade.

SAN WILFRIDO.—This Tyne-built tank steamer has been destroyed by mines in the Elbe. There was no loss of life.

WIRELESS CONTROL.—Owing to the state of war, the Wireless Telegraph Service has passed under the control of the Government.

MESSRS. EARLE'S SHIPBUILDING YARD, at Hull, has been taken over by the Admiralty for repair work, if required, to His Majesty's ships.

BOARD OF TRADE.—Mr. John Burns has resigned the office of President of the Board of Trade. Mr. Walter Runciman has been selected as his successor.

THE MERCHANT SHIPPING (CONVENTION) BILL has passed through all its stages in the House of Commons. The Act is to come into operation on 1st July, 1915.

PALMER'S SHIPBUILDING CO.—Mr. Daniel Kemp has been appointed to the general managership of the engine-works department of Palmer's Company, Jarrow, in place of Mr. J. W. Reed, who has resigned.

MESSRS. YARROW & CO.—It is stated that if Messrs. Yarrow and Co. are satisfied with the speed of completion of the three new destroyers, *Miranda, Minos and Manly*, upon which their men are working day and night, a bonus of £1,000 will be distributed among the workmen.

AT the invitation of the Admiralty, the Management Committee of the Imperial Merchant Service Guild have nominated their Secretary, Mr. T. W. Moore, as a member of the new Arbitration Court, which will deal with questions concerning merchant ships arising out of the war.

MARINE SOCIETY.—The Marine Society, in their publication, *The Marine Magazine*, have an interesting illustrated article on "Armed British Liners." The same journal gives a full report of the annual inspection of the training ship *Warspite*, by the Earl of Shaftesbury. Lady Shaftesbury distributed the year's prizes.

ROYAL NAVAL RESERVE.—A qualification for promotion to the active rank of Commander in the R.N.R. is to have held command of a British ocean going passenger steamer of not less than 4,000 tons for three years. The Admiralty has power, however, to promote officers to this rank, without such service, if they have any special service to their credit.

ANTARCTIC EXPEDITION.—The insurance has been effected of the hull and machinery of Sir Ernest Shackleton's Antarctic ship *Endurance*. The amount of the insurance is £15,000, and the vessel will be covered against risks throughout her voyage. She will be the first vessel to be insured in the ice zone, as, hitherto, insurance of vessels on similar undertakings has ceased at the last port touched at.

THE SHAMROCK.—The steam yacht *Erin*, in charge of Sir Thomas Lipton's racing yacht *Shamrock*, reached New York on the 17th August. The two yachts had to take shelter at Bermuda for three days to avoid a German cruiser. The *Shamrock* has stood the voyage well. Owing to the war it has been arranged to postpone the races for the America Cup till next year.

THE "TITANIC."—On 29th of July, Lord Charles Beresford unveiled a statue to Captain Smith, who commanded and went down with the White Star liner *Titanic* in 1912. On 17th of July, Mr. Landon Ronald, Principal of the Guildhall School of Music, unveiled at the Institute of the National Orchestral Association, Archer Street, London, W., a memorial to the musicians who perished with the vessel.

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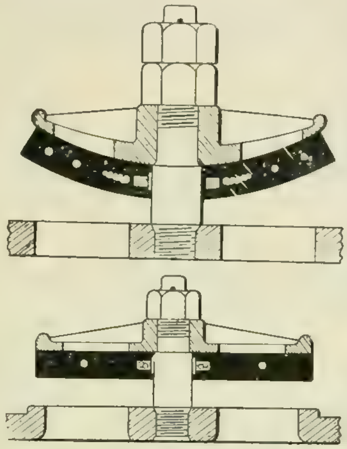

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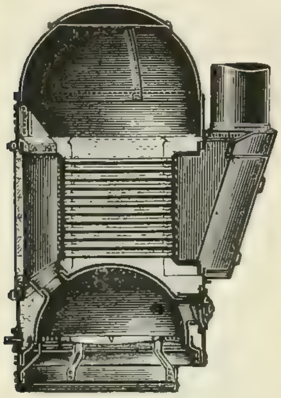

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Continued from p. viii.

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Kelvin, Bottomley & Baird, Ltd., 16-20, Cambridge Street, Glasgow.

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Ferguson & Timpson, 104, Minories, London, E.C.
Greene, Tweed & Co., Queen Anne's Chambers, Tothill St., London, W.C.
Mosses & Mitchell, 122-124, Golden Lane, E.C.
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Woodite Co. Mitcham Common, Surrey.

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McNeil, Chas., Kinning Park Ironworks and Hydraulic Forge, Glasgow.

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Toope's Asbestos Co., Ltd., Stepney Square, London, E.
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Delta Metal Co., Ltd., Delta Works, East Greenwich, London, S.E.

METALLIC TUBING.

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Hayes, Edward, Wolverton Station, Stony Stratford.

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Heath & Co., Ltd., Crayford, Kent, and London.
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NAVAL TELEPHONES.
Graham & Co., Alfred, St. Andrew's Works, Crofton Park, London, S.E.
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OIL REFINERS AND BLENDERS.
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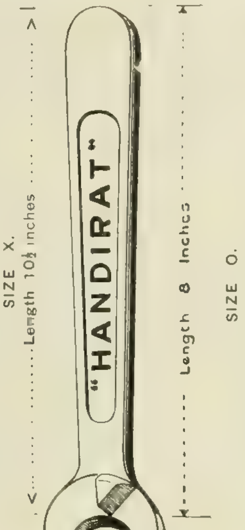

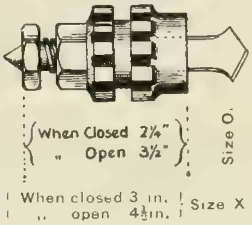

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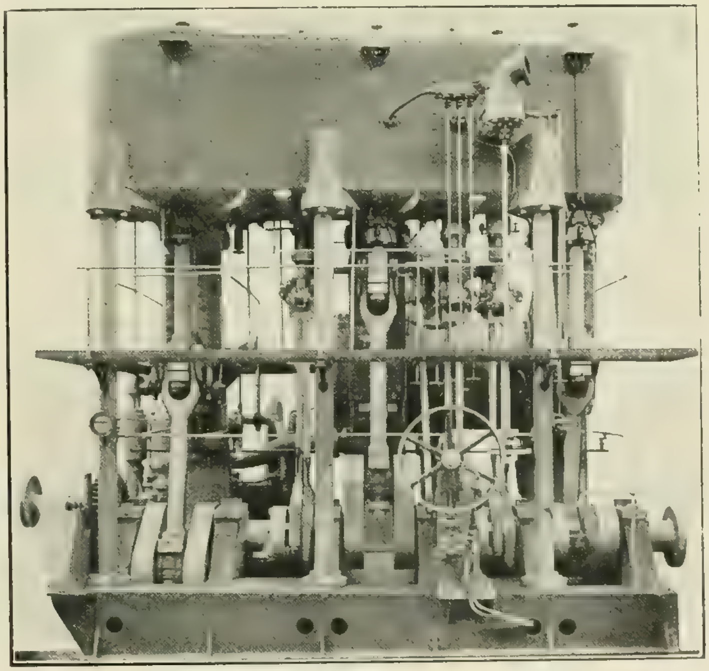

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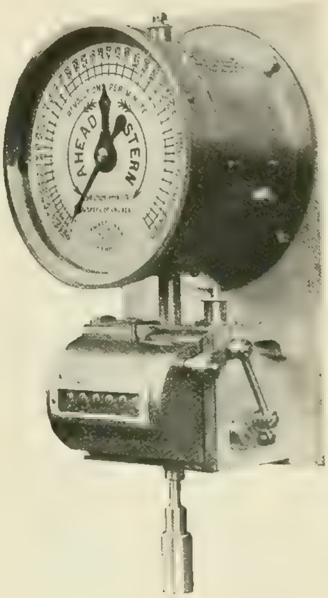

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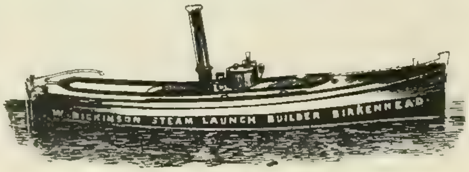
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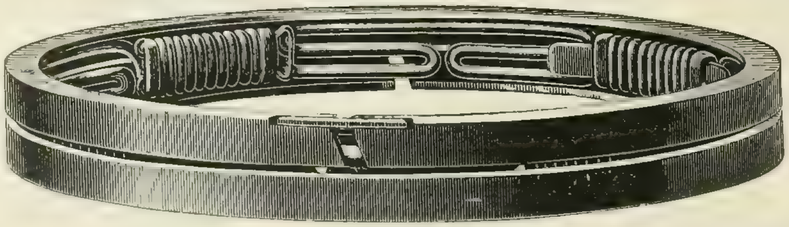

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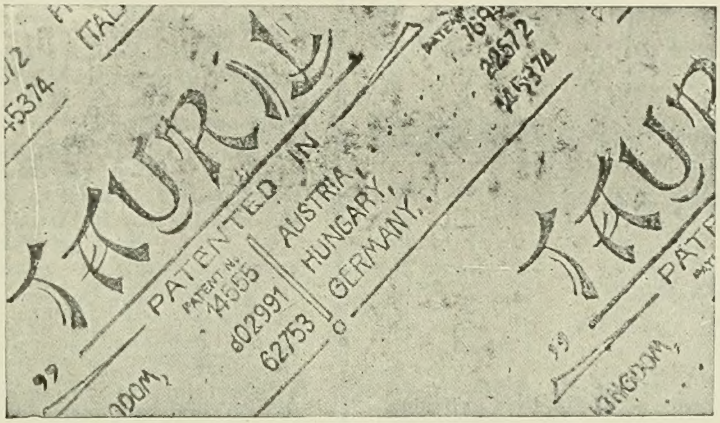

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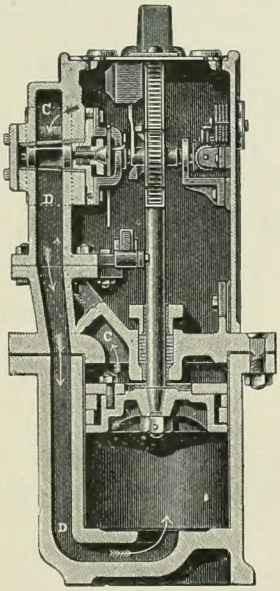

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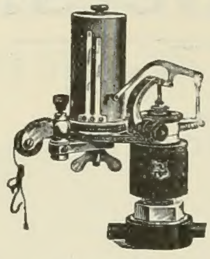

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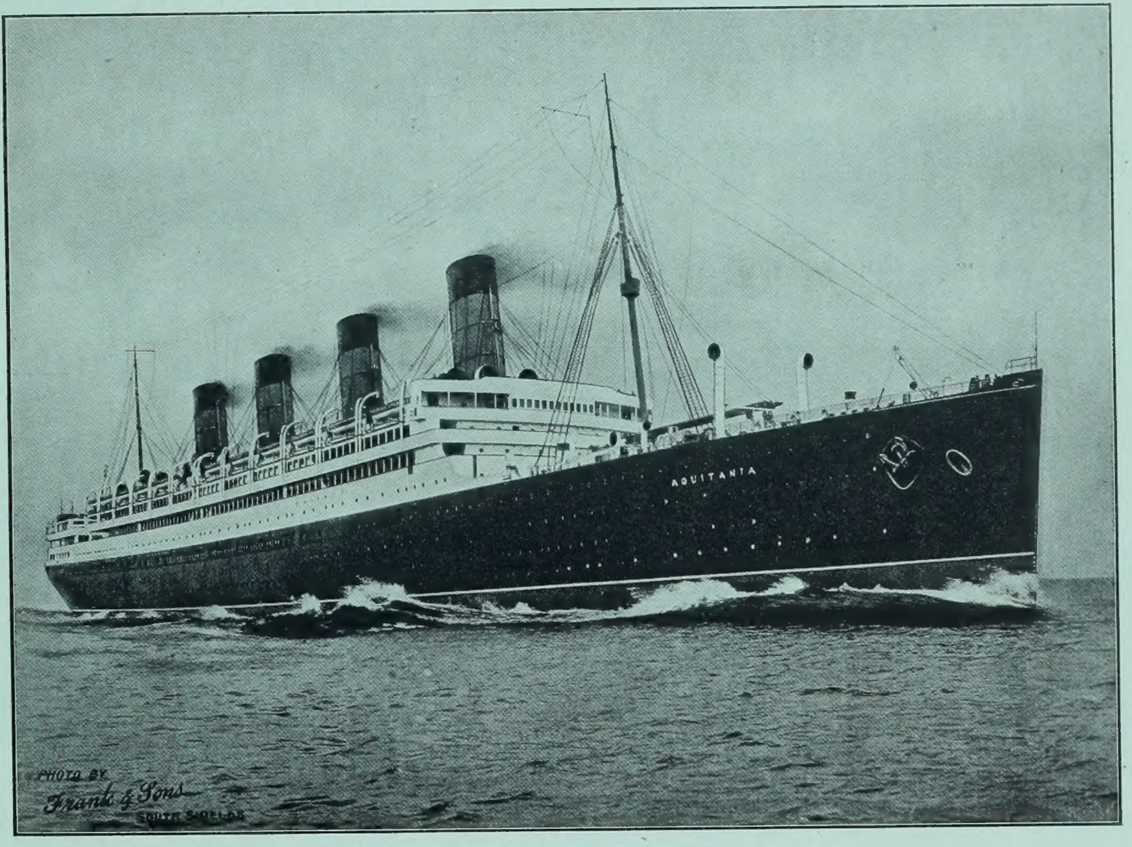

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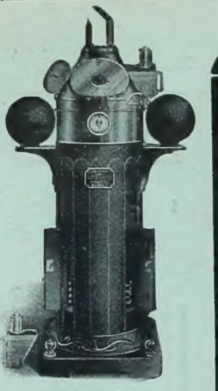

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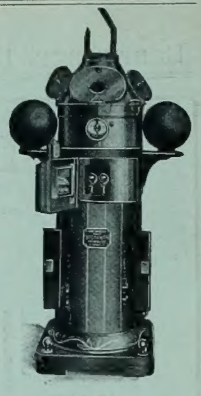

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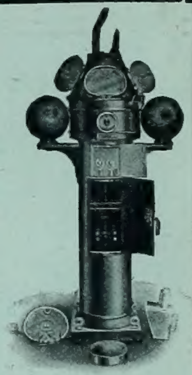
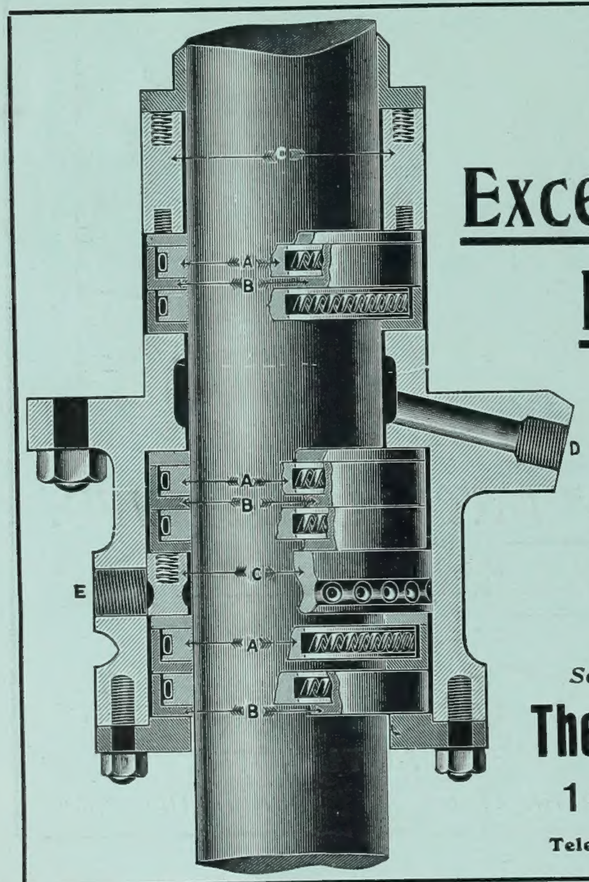


Mark IIB.



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